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Agricultural Education in the Netherlands

by

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HIGHER AGRICULTURAL EDUCATION.

The seat of higher agricultural education is the National College of culture, Horticulture and Forestry at Wageningen. Previous to 1906 college was connected with the National Agricultural School at Groninthe National Horticultural School and the Municipal College, all four g under the management of the same board. Since its separation from e other institutions the Wageningen College has undergone considerable lopment both as regards attendance and equipment. Teaching is now lucted on academical lines ; the courses are open to all, but only students have been through the secondary schools (modern or classical) are aded to the examinations. It already possesses good laboratories, a ıry, buildings for feeding experiments, etc., about 100 acres of land and ecial hothouse for tropical plants. The following institutions are ched to the College : 1. Phytopathological Institute, which is also the lquarters of the Government Service for the protection of plants. he Institute for Agricultural Machinery and Construction. 3. The Insti- for the Sugar Industry, which undertakes more especially the training oung men for the East Indian sugar plantations. 4. The recently founded it Breeding Institute.

The staff of the College consists of 28 lecturers and a number of assist-. Instruction is given in all branches of agriculture, horticulture and stry, both Dutch and tropical. At present 247 students are in attendance; ese, 34 have specialised in Dutch agriculture, 39 in tropical agriculture, horticulture, 5 in Dutch forestry and 44 in tropical forestry. The aining 119 students are still following the preliminary unspecialised ses.

2. Secondary Agricultural Education.

The secondary agricultural schools comprise the National Agricultu School at Groningen and the Colonial School at Deventer. In 1896 so-called "Indian class" was founded at the National Agricultural Sch to deal with tropical farming. In the colonial school the course lasts tw years, at the Groningen school two and a half years. Both schools are w equipped as regards qualified masters for teaching natural science, ag culture and other technical subjects. (For curriculum, etc., see Tabl I and II in appendix).

3. Special Schools and Special Courses.

(a) *National Dairy School at Bolsward.* — The course at this sch extends over two years and is intended specially for managers of butt and cheese factories. Besides practical cheese and butter making the pri ciples of commerce, book keeping and commercial correspondence i French, German and English are taught. Only students who have had least eighteen months' practical work in a butter or cheese factory a admitted, and they must undertake to work in a dairy during their v cation, producing a certificate to that effect at the end of the vacatio Forty students were in attendance in the year 1912-1913.

(b) *Agricultural and Horticultural Winter Schools.* — The course these schools lasts over two winter terms. There are at present in the Neth lands 9 agricultural and 5 horticultural winter schools, which are on t whole very well attended and much appreciated by the country peop They are especially adapted for lads whose presence at home is indispe sable during the summer or whose means do not allow them to attend secondary agricultural school. In order to be admitted, it is sufficient have passed through the elementary schools, though the winter scho are also frequented by lads who have had a rather better education. T instruction given is purely theoretical, like that given in the National Ag cultural College and in the secondary agricultural schools, and it is adapt to the special agricultural conditions of the districts in which the scho are situated. In the horticultural schools some facility for practical wo is afforded by the school gardens. In the year 1912 the agricultural a horticultural schools were attended by 349 and 155 pupils respectively.

The directors of these schools are usually specially qualified in agric ture or horticulture and have under them one or two permanent teach and some temporary elementary school teachers. Further details of t curriculum are given in Tables III and IV. Only pupils over 16 years age are admitted, for in the Netherlands, as in other places, experience h shown that the older pupils profit most by the instruction. It is v desirable that the lads should attend continuation classes in the inter between leaving the elementary schools and joining the winter scho Such classes exist in the country, but hitherto too little has been done their development.

The fees at the winter schools are low, at most 16s per term, while books amount to about £2 per head. As most of the pupils live in the imme- e neighbourhood of the schools their total expenses are very moderate. ıe pupil cannot afford it, the payment of the fees is not insisted upon in such cases the books are also frequently supplied free of charge he school. Scholarships are available besides, and allowances are e by associations and by the local authorities.

ll winter schools are national institutions; this year, however, the Catho- ssociation for Agricultural Education will open a private winter school h will also receive a State grant. There is further a school of horti- re, which is not a winter school proper but resembles it in character. It founded by the Frederiksoord Beneficent Association with funds ı by General van Swieten.

(c) *Winter courses in agriculture and horticulture.* — This form of educa- is especially intended for those young farmers and gardeners whose nce at home cannot be dispensed with for any length of time even in r. The courses generally extend over two winters and include from o 400 hours of instruction. The lecturers are elementary school teach- ho have undergone special training in agriculture and horticulture.

The courses in agriculture and horticulture are organised privately sociations and occasionally by local authorities, but they are subven- d by the State, which generally pays the lecturers and provides the rial. Such courses are in great request throughout the country, and number is constantly increasing. Unfortunately suitable lecturers are wanting, but it is hoped that their numbers will soon increase, as ıl provision is being made for their training. In the year 1912-13 al of 405 courses on agriculture and 119 courses on horticulture was with an attendance of 6015 and 2203 pupils respectively.

d) *Agricultural and horticultural courses for adults and special courses.* ese courses, as a rule, consist of twelve lectures lasting two hours The lecturers are usually teachers with much practical experience. e winter 1912-1913, 131 agricultural courses and 78 horticultural s were held and they were attended by 3729 and 1567 students tively.

pecial courses are given in poultry keeping, horse shoeing, and live management.

e) *Agricultural instruction for soldiers.* — On request of the military rities, instruction in agriculture has been given to the soldiers of some ons since 1905. This is especially intended for those men who have brought up in the country. A whole course consists as a rule of 12 s of two hours each on questions connected with manuring and live management. The lectures are generally well attended. In the of 1912-1913 these courses were held in 16 localities and attended soldiers.

f) *Agricultural education for women.* — During the last few years, a start o been made with regard to instructing the female rural population. respect the Netherlands are perhaps behind several other countries.

Formerly when butter and cheese were made in almost every farmhouse, s cial courses were held in these subjects. At present except in a few d tricts in South Holland and in the province of Utrecht, butter and che are made exclusively in factories, and dairy courses are only held in t limited districts mentioned above. In districts with light sandy soils, wh small holdings are very numerous, special courses on livestock manag ment, feeding, etc., are held for women. Of still greater importance, ho ever, are the courses on domestic subjects, such as cooking, housewo first aid, gardening. In general the tendency is to get women teache for the purely domestic subjects and special agricultural or horticultu teachers and medical men for the others.

Hitherto domestic economy has only been taught in short courses. On one permanent school exists in the country, that at Lierop, which was open in 1911; it is chiefly a cookery school for peasant women conducted Catholic sisters. This year a new National School of Domestic Econo will be opened; for the present, only teachers of domestic economy will trained in it. The courses on domestic economy are usually organized by cultural associations who have special grants from the Government. the year 1912, 53 courses were held, and attended by 1100 women s dents. In some places courses have been held for the wives of agricultur bourers; they have awakened much interest and will be continued.

With regard to the amounts of money granted by the Government agricultural education, it should be noted that out of the total popula of 5 411 800 inhabitants, about 2 683 800 live in the towns and 2 728 in the country. In the budget for 1913 the following sums were vot

For the National College of Agriculture, Horticulture and Forestry.	£ 22 875
For the two Secondary Agricultural Schools	» 7 361
For the National Butter and Cheese-making School	» 1 136
For the Agricultural and Horticultural Winter Schools	» 9 183
For other courses	» 16 333

Besides the Government grants, contributions to agricultural ed tion are also made by associations and local authorities, but as these greatly no reliable data can be given.

Appendix.

LE I. — *Curriculum of the Secondary Agricultural School at Groningen.*

	Number of hours per week				
	Class I		Class II		Class III
	Winter term	Summer term	Winter term	Summer term	Winter term
ıl Science: Chemistry, Technology, sics, Botany, Zoology and Mine- gy	13	11	7	6	4
y, Geography, Mathematics . .	8	5	1	1	3
a'es: Dutch, German, French, lish	9	7	4	4	3
nics	—	—	1	1	1
lture	2	9	19	20	21
Total . . .	32	32	32	32	32

BLE II. — *Curriculum of the Secondary Colonial School at Deventer.*

	Number of hours per week		
	Class I	Class II	Class III
l *Science*: Physics, Chemistry, Zoo- Botany	10	9	12 ½
ıatics, Surveying, Drawing	7	8	4
ges (1): Dutch, German, English, ch, Javanese, Sunda and Malay . .	8	5 ½	6
l *Agriculture*: General, Special crops, stock management, Book keeping .	11	15 ½	15 ½
stics, First aid	2	2	1
Total . . .	38	40	39
l work included in the above time	8	10	8

erman, French, Javanese and Sunda are optional subjects.

TABLE III. — *Curriculum at the Groningen Winter School.*

	Number of hours per wee	
	Class I	Class II
Natural Science:		
Chemistry, Physics Botany, Zoology	12	7
Dutch, Arithmetic, Surveying, Mechanics	6	4
Agriculture:		
Soil and Plants	4–6	6
Animal husbandry and allied subjects.	10	12
Farming and Book keeping.	—	3
Total . . .	32–34	32

TABLE IV. — *Curriculum of Horticultural Winter School at Bosko*

	Number of hours per week		
	Class I	Class II	Clas
Natural Sciences:			
Botany, Plant Diseases, Physics and Chemistry . .	8 3/4	5	13
Horticulture:			
Plant breeding, Growing of ornamental trees, Fruit growing, Landscape gardening	6 1/4	10 3/4	17
Commercial subjects:			
Correspondence, German and English, Arithmetic, Commercial Gebgraphy, Book-keeping:	6	5 1/4	1
Total . . .	21	21	4

The Present Position of the Science of Manuring in Gerr

by

PROFESSOR M. HOFFMANN, of Berlin,

Manager of the German Agricultural Society.

The discussion of this question is made easier by the publication o symposium on " New Methods and Aims in Manuring ", in the March April numbers of *Mitteilungen der D. L. G.* for this year. In this ar the leading experts express their views, and consideration of these po

s to the regrettable conviction that we have not yet been able to
: the weightiest problem of the science of manuring, namely how to
out, rapidly and surely, the manurial requirements of a given piece
nd before a crop is put into it.

Yet there is no doubt that we have got a good deal further in this di-
on in the last ten years, and for this we have especially to thank the
ts of KÖNIG (at Münster), MITSCHERLICH (at Königsberg) WAGNER (at
nstadt) and PFEIFFER (at Breslau), who have done much to increase
nowledge of the analysis of soils and crops. It is true that water con-
ng carbonic acid was known to the older agricultural chemists as a
s of obtaining a soil extract suitable for analysis, but the finer type of
imental and critical observation work was not yet undertaken.

To Mitscherlich belongs the credit of having instituted researches
ding the temperature, concentration, and duration of influence of
gent, and of obtaining partially satisfactory results from them. He
eded in finding out, with reference to the cultivation of spring sown
ls, a regular relation between the quantities found in the carbonic soil
ct and those recovered in the harvested crop, although his experiments
not yet stood the test of independent investigation.

t will be interesting to see whether the methods suggested by König
etermining the assimilable mineral plant foods of the soil prove re-
. König starts from the assumption, which has a good deal to be
or it, that the pioneer work of microorganisms, yeasts and catalases in
ing into solution the compounds of potash and phosphoric acid in
il, is most readily investigated if the soil to be examined is previously
ed under pressure. For potash requirements, König believes in steam-
r 5 hours under a pressure of 5 atmospheres : as a result of his la-
xperiments, he arrives at certain standards, as for example that soils
ich the potash content rendered soluble by steaming only amounts
gms. per 100 gms. of soil, will benefit by a potash dressing, whereas
figure reaches 8 mgms. the soil does not need potash ; in the same way
which after steaming, gives less than 4 mgms. of soluble phosphoric
vill profit by a dressing of phosphates. At the same time he does not
reject as an extracting agent the 2 per cent. citric acid solution re-
ended by GERLACH of Bromberg more than a decade ago. Unfortunate-
indefatigable veteran experimenter has not hiherto, in the course
comprehensive researches, been able to determine definite relations
en the quantity of nitrogen and of lime taken up by plants and the
te quantity of these substances existing in the soil. He is, however,
ion that in this case the percentage content of the dry matter of plants
les a sufficient clue as to whether these substances are present in the
sufficient quantity.

uch an admission as this is a further stimulus toward plant analysis,
plicability of which has, in the last few years, been advocated by
er and Pfeiffer. Wagner's doctrine, according to which a meadow the
urgently needs manuring with the chief fertilizing agents, the more
the content of its air-dried hay varies from the limit values " 2 per

cent. potash, 0.7 per cent. phosphoric acid, 1 per cent. lime", has already be many times confirmed, and steps are now being taken to establish simil standards for spring-sown cereals. In calculating an analysis of hay, th fact must be borne in mind that, as a rule (and my own investigatio support this), the second cut is richer than the first in P_2O_5 and in Ca as well as in protein, while on the other hand the potash content i lower. It may here be remarked that nitrogenous manuring for meadow and pastures has come more into fashion in Germany, in the last fe years than could justifiably have been expected from the opinion hither prevailing on the subject.

Speaking generally, however, the pot and field experiments which Wa ner has developed in so masterly a manner, continue to hold the first place i the determination of manurial requirements; Hiltner who also showed th possibility of applying potash and nitrogen to plants direct through the le organs is now occupied in arranging water culture experiments with th same object.

Should the farmer not be in a position to make use of experiment which, after all, only tell what happened on a given piece of land, he woul do well to call to his assistance the so called "Soil Statics", and keep soil account-book; though this might not be necessary for the whole fa or for the whole of the arable land, at any rate it would be of value for t individual "hungriest" fields. Soil Statics, that is, the science of balan ing the intake and output of the plant foods in the soil in relation to power of plant production, which was, before the introduction of artific fertilizers, a much valued means of determining manurial requirement has not achieved the success expected of it after the recent efforts to rest it to favour. All the same soil statics, as proved by my own comp hensive experiments, provide the critically minded arable farmer w a useful indicator, particularly as to whether a further applicati of potash and phosphoric acid is profitable; for fertizers like nitro and lime, which are easily modified or washed out of the soil, the meth is less suitable. The subject is fully explained in Part 251 of *Arbeiten D. L. G.*

A fact which is not without its significance in the practical applicat of statical calculations is the discovery, which has received repeated confir ation, that the ratio between the plant foods found in the composit of normal plants is something like 100 N : 50 P_2O_5 : 150 K_2O : 80 C although many plants, the Leguminosae for example, show considerable vergences from these proportions. The farmer who reckons out his st of the principle plant foods per acre for each piece of arable land on the sis of an up-to-date and complete soil analysis, and from this substracts quantity of plant foods contained in the forthcoming crop at harvest lowing about 1 per cent. for wastage) on the above ratio, will be able measure approximately, before the annual crop sowing, the quantitie manure which he must still apply to his land. In doing this, however must take into consideration the average coefficients of utilization of said plant foods and all the other factors which influence the produc

ity of the soil. If he continues this calculation in the following , he will, of course, not need a fresh soil analysis, the previous year's s being used as a basis.

There exists at present no method at once rapid and entirely free from tion, of determining the manurial requirements — not the plant food re- ments — of a soil, and there is not likely to be one until the biological olloido-chemical actions taking place in the soil have been more clearly d. The work of decomposition due to bacteria, the numerous sour- production of carbonic acid and the conditions affecting the coagulation loid substances which is important for growth, are matters too com- ind varied, even on the smallest scale, to admit of being expressed in testable numerical terms, in the light of our present knowledge and our present methods of investigation.

part from the revival of Statics, the Law of the Minimum has very ly formed the central point of numerous investigations. The en- ur to find a symbolical representation of this fundamental Law of Na- n the basis of Wollny's definition gave rise to a keen competition, cribed in detail in my report on the prize competition on this subject t 245 of *Arbeiten der D. L. G.* In this connection it should be noted litscherlich, on the proposal of P. Mazé, wants this law, which was y known to Karl Sprengel, to be designated "The Law of Physiolo- Relations", since the amount of plant-production depends on the col- effect of a number of growth factors, each of which individually exer- n that amount a retarding influence proportional to its own proxi- o the minimum. This suggestion may contain a germ of truth, the same time the name "Law of the Mimimum", chosen by Lie- ll not so soon disappear from the vocabulary of practical scientists; may well be preserved for application in the case of plant foods, since re factors over which man can exercise a vigorous control.

le present current of opinion in this sphere is strongly influenced fact that certain factors formerly regarded as bring present in excess, mple carbonic acid, are now suspected of being present only in the m quantity. Individual experiments with ornamental plants at flowering in glass-houses is considerably improved by applications on dioxide, made by means of a cylinder, or by the action of hydro- acid on marble, or by burning alcohol. Similar success was looked h agricultural crops, from the application under the soil, of carbonic ther in the form of gas by means of pipes, or by means of rapidly osing organic substances. Unfortunately this success has hither- practically unattained, but all the same the problem, on which less a number of accurate studies by earlier investigators, will still in view, just as for a considerable time the question of making a roductive use of the sun's energy, in combination with artificial g and manuring, has been under discussion.

s not without interest to recall, in this connection, that STRACKOSCH, ha, who established the "Law of the Variation of Work done by ed Plants", and who started the idea of the "Assimilative Effect"

(relation between the utilizable substances produced and the quantity plant food consumed), succeeded in obtaining an increase of yield amou ing to about 11 shillings an acre by altering the cropping scheme on i estate at Hohenau in accordance with this " Assimilative Effect "; th results he described in a lecture before the Royal and Imperial Agricultu Society in Vienna. (See *Österreich Agrar-Zeitung*, 1913, No 18).

In this case " Energetics " may be said to play a part inasmuch, Strackosch avails himself, for the determination of the effective utilizat value, of Kellner's " Starch Equivalents " that is to say, of a conceptio based on " Energetics ", as Remy has already pointed out.

Even, however, if more arable land is eventually to be permane cropped than is at present the case, the sun's energy will still remain no than a powerful contributing factor in the development of private national wealth. The quintessence of human art in agriculture lie my opinion, in the correct application of fertilizers to well prepared and in sowing productive varieties.

As SCHULZE, of Breslau, has recently shown, the remains of the r and stubble of grain and of root-crops do not by a long way leave in soil the quantities of plant food required for the attainment of maxi harvests; even if, in the case of Leguminosae, the whole of the a portion of the plants on a field were also applied as green manure, utilization of them by the succeeding crop by means of bacterial chemical processes, assisted by the return of plant foods from the t of the plants before they are ripe for harvest, would still, in the majo of cases, by no means come up to expectation. According to the experiments published by Professor VON SEELHORST in Part 241 of *Arb der D. L. G.*, the losses by washing out of nitrogenous green manure very considerable on light soils, so that the utilization during a three-co rotation may be taken at only about 30 per cent.

The same applies, in the long run, to the utilization of the nitro in farmyard manure, which can, however, be greatly improved by keep the liquid and solid manure separate in the cowhouses; the liquid ma should be kept from contact with the air in a tank with a lid, and sh also be covered with a layer of petroleum or oil. Ortmann, who owns manor of Schependorf, has been trying for some time to introduce a met of storage of this kind into general use in Germany, and such endeav are worthy of support, for with nitrogenous manures at their present p it makes a considerable difference whether one employs liquid ma containing 1 or 2 per thousand nitrogen or that containing 6 or 7 per t sand. Recent experiments have shewn that liquid manure treated in manner produces excellent effects, equal to those of ammonia, but it s be thoroughly covered with earth, immediately after being applied, o least be ploughed in shallow, as in the case of farmyard manure well so with urine (box or yard manure). If it can only be used as a top-dres it is profitable to add crude sulphuric acid as a preservative.

A further series of experiments is now in progress in Germany, the object of discovering within what limits home produced manures

laced by commercial manures. The trials which have been carried ing the last 70 years on the home farm at Wingendorf near Freiberg, ony, seem to show that this method of farming cannot be continued th several decades without fundamentally impairing the yield, except od soils containing plenty of humus, and even then, only when the is of the roots and stubble are allowed to accumulate for the enrich- of the soil.

he majority of the German farms carrying no live stock work princi- with green manure or, in some parts, also with night-soil combined eavy dressings of artificial fertilizers, while here and there manure is ised from neighbouring towns, or straw is handed over to neighbouring s to be used for making manure and returned. Farms using only ercial fertilizers only exist in isolated cases, or this system is confined outlying portions of the farm. In any case, it has been found again gain that profitable root crops can, as a rule, only be obtained by an gent combination of home produced and commercial manures, while following a previous crop dressed with farm-yard manure or green e usually pay well for a complete dressing of artificial fertilizers to the previous crop and to the strenght of the soil. It is a universal all the better managed farms, to keep the replacing of plant foods inimum, or, having regard to the kind of manure, crops, and soil, the rotation practised and the general circumstances of the farm, roach the line of soil enrichment, taking into account the time occu- y the various farm crops in absorbing plant food.

gricultural chemists in Germany are busily engaged in determining lization coefficients and the best adapted forms in which to apply ome-produced and commercial manures under the most widely g conditions ; numerous articles have been published on the agricul- alue of all these fertilizing materials, especially the different forms sphates, potash, and above all nitrogen, such as that contained in of soda, nitrate of lime, nitrate of potash, ammonia, and or- nd cyanic nitrogen. Nitrogen is the plant food most often present minimum quantity, and unfortunately it is also the dearest. It is re not surprising that it is this element which is the subject of the tensive study, a fact which is also manifested in the numerous appli- for patents having for their object the utilization, for fertilizing es, of the nitrogen of the air. But technical science is also endeavour- make use of crude phosphates, minerals containing potash, and the re limes, and to make them available to agriculture as fertilizing ls—with what success, Pfeiffer and Lemmermann have reported in urnal. (1)

tash salts are at present being worked at more than 150 mines, and, ber, represent up till now a natural monopoly of Germany. The fu-

(1) See "The Possibility of Using Crude Phosphates and Limes containing Silica as ", by Prof. TH. PFEIFFER, *B.* Sept. 1913, pp. 1316-1321; also "The Possibility of g Stassfurt Salts by Finely Ground Phonolite, Leucite, etc.", by Prof. LEMMERMANN, 1913. pp. 1483-1495. (*Ed.*).

ture will shew whether this will continue to be the case, and whether deposits discovered in recent years in the north of Spain and elsewhere promise of profitable working. For the present, they can only be regard as of historical interest, in the same way as the working of certa quartzrocks for platinum recently undertaken in Westphalia.

A special interest has become attached in the last few years to three substances magnesia, silicic acid and sodium. Since Profes Willstätter ascertained that the colouring matter of chlorophyll contai about 4 per cent. of magnesia, but no iron, this base has received the atte tion it deserves, and this not only for the sake of proving Loewe's the of the so-called " Lime Factor ". Similarly, sodium and silica, which ha come into prominence on account of the discussions on phonolite and researches into the chemistry of colloids, have become the subject of rec investigations ; Schulze, among others, has been able to prove a direct tritive effect of sodium. It is true that the preparation named " Nat mon ", an artificial product composed of 75 parts of sulphate of ammo to 25 parts of common salt, has not been able to establish itself in practi but on the other hand an addition of rock salt to nitrogenous manu containing no sodium was accompanied by the most successful resu especially for plants requiring sodium, *e. g.* mangels and beets, barley a certain vegetables. As regards silica, German agricultural chemists ma tain their previous opinions.

It would take too long, here, to go into the experiments which have their object the investigation of what are called catalytic fertilizers or mulants, such as the salts of sulphur, manganese, boron, aluminu lithium, rubidium. As we cannot deal with questions having at pres no practical significance, we must leave out of consideration the ques of drilling in fertilizers and using the rotatory spreader, as opposed to broadcasting method prevalent in this country, also the question of applicability of powerful, high percentage preparations of urea, and the composite manures, known as nitrate of ammonia and nitrate-phosphat and, in general, all the latest — and unfortunately also in most cases sh lived articles which appear on the manure market. The said mar seems likely soon to be brought under Government control in Germa as already elsewhere.

It is certain that the great increase in the consumption of artifi fertilizers (see Table II, p. 984), and the corresponding increase in our c yields (see Table I, p. 983), which represent an expenditure of some million marks by the German farming industry, are due not to the suppo tions of ministers nor to unsound or misleading theories, but to systema and representative researches, clear sighted regulation of the means communication, and distribution, on the widest scale and in the shor time, of accurate reports of the results of experiments. In this wa apart from the advertisement departments of the great manure manu turing houses, the chambers of agriculture and agricultural socie (notably among them the German Agricultural Society) each have th meritorious part, as have also, in particular, the schools of agriculture

travelling instructors, the agricultural colleges, and, of course, the iment stations. It should here be observed that it was also the Ger- Agricultural Society which extended its researches from field, meadow asture, to orchard, vineyard, forest and lake. At the same time this :y afforded financial assistance for the training of young students in ›ds of research and exerted itself to bring to a satisfactory solution terpretation of the results obtained from manurial experiments. Since oundation of the Imperial Fund for Advertizing Potash, it has iately been also possible to introduce the employment of artificial ters into the tropical agriculture of the German colonies in a clear- d and comprehensive manner, and even to establish there, for that se, trained agricultural chemists.

here is no doubt that, in spite of being heavily overburdened with ork of analytical control of agricultural goods, the representatives of in manurial science have made good use of their time, and that many ave been filled up in the sphere of knowledge entrusted to them within st ten years through their accurate and methodical researches.

; is a matter for congratulation that the Government and other com- : authorities recognize the activity and success of these experiment is, and assist in promoting the development of all institutions of this

Another step to be hailed with satisfaction is that the experiment is themselves are seeking to form separate departments for research ntrol—indeed many are going still further and resolving themselves :parately located and separately administered research stations and l stations. Finally, it is to be hoped that the State may gradually e control of all experiment stations, just as in the same way the ques- ould be considered of a uniformly regulated training for the rising tion of agricultural chemists. Then the far-reaching conceptions ie numerous details introduced in the above-mentioned symposium more speedily attain a satisfactory solution, to the great benefit iculture and of political economy.

Appendix.

ILE I. — *Average yields of the chief crops in Germany*, 1890-1912 (*lbs. per acre*).

	Rye	Wheat	Barley	Oats	Potatoes	Meadow hay
— 1894–95	1 170	1 460	1 480	1 290	9 390	2 960
— 1899–00	1 280	1 580	1 480	1 410	10 380	3 620
— 1904–05	1 380	1 700	1 650	1 530	11 500	3 590
— 1909–10	1 490	1 780	1 740	1 720	12 400	3 870
. . . . .	1 590	1 850	1 780	1 590	9 230	(1) 2 910
. . . . .	1 660	2 010	1 950	930	13 410	(1) 4 100

Irrigated meadows: 1911 — 4 000 lbs.; 1912 — 4 940 lbs.

TABLE II. — *Consumption of commercial fertilizers in German agriculture*, 1890-1912.

	1890 — metric tons	1900 — metric tons	1910 — metric tons	1912 — metric tons	Value in m... of Marks
1. Bone meal	99 001	63 462	81 063	75 500	c.
2. Guano (artificial and natural)	45 888	37 450	40 200	40 200	
3. Superphosphate (incl. misures)	500 000	754 944	1 267 060	1 640 600	
4. Basic slag	400 000	878 917	1 428 633	1 800 000	
5. Nitrate of soda	247 815	352 785	542 137	630 250	
6. Sulphate of ammonia	60 000	117 638	268 330	356 150	
7. Various (cyanamide, nitrate of lime, dried blood, horn meal, etc.)	50 000	50 000	60 000	100 000	
8. Potash salts (total)	219 553	833 472	2 219 037	2 700 000	
(As crude potash salts)	—	(774 916)	(1 953 964)	(2 320 000)	
Total (1)	1 622 257	3 088 669	5 906 530	7 352 700	c.

(1) Owing to lack of precise data, these figures are only approximate, except for po

Lime may be estimated at 800 000 to 1 000 000 metric tons, w 12 to 14 million Marks ; this sum may be set against the mixed man (ammonia-super, etc.) included with superphosphate, so that the total will not be materially altered.

The prices of the chief artificial manures have diminished consider since 1870 ; this fall is to no small degree due to the competition of n manures, such as sulphate of ammonia and basic slag. The whol prices have been about as follows :

	Unit of N in nitrate of soda	Unit of water-soluble P_2O_5 in superphosphate
	s	*s* *d*
1870	25	9 6
1890	15	6 6
1912	14	3 5

Potash salts and limes show no distinct change over the last de but a slight rise has very recently set in. Kainit was at 18*s* a ton in and down to 15*s* in 1900, while 40 per cent. potash salts have been so about £3 4*s* per ton since 1890. Since the Potash Law came into (beginning of July 1910) the crude salts with 12 to 15 per cent. of K_2O been sold at 1*s* per unit (carnallit with 9 to 11 per cent. only 10*d*), the prepared salts with 40 to 42 per cent. K_2O have made 1*s* 6 ½*d* per

The Dairy Industry of Great Britain

by

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For the last twenty years the Dairy Industry in Great Britain has been ily growing in importance, and dairy farming has to a large extent the place of other kinds of farming.

This may be accounted for by the increased consumption of milk by opulace, which has been and still is being educated to realise the eeding value of milk, which has become more and more part of the al everyday diet of adults as well as children.

An estimate made some time ago put it that the annual increase in nsumption of milk amounted to some 5 000 000 gallons, but it is ful if such will continue the annual figure if the retail price of milk luly increased. But whilst people are learning more concerning the of milk in their daily dietary, it is as yet difficult for the majority to that in proportion to its cost it is the cheapest food obtainable. Thus, the price of most foods has gone up recently, that of milk also has slightly increased. An increase in the price of milk, however, is gen- resented by the public, which resentment is apt to show itself in rm of a decreased consumption. People would not, however, endea- to effect economies in their living expenses by cutting down the quan- f milk purchased if they possessed a proper knowledge of the feeding of this food in proportion to its cost. Undoubtedly no other food can tained in Great Britain at as cheap a rate, taking into consideration d value.

ow of what value is the Dairy Industry of Great Britain at the pre- ime? The answer is supplied in some figures recently published e Statistical Department of the Board of Agriculture, by which it is that the estimated quantity of milk produced, after allowing for nount used for calf-rearing, is 1 208 000 000 gallons per annum.

s to the manner in which this milk is dealt with, it is calculated that cent., or 850 000 000 gallons, is sold as milk, whilst the value of iry products respectively as sold by the farmers is:

	£24 963 000	for milk
	£ 590 000	» cream
	£ 2 940 000	» butter
and	£ 1 400 000	» cheese.

hese figures show very clearly the great value to the farming in- of the milk sold for consumption in the towns, whilst the total sum d for the milk and its products is about the same as that realised e wheat, barley and oats grown. Furthermore it nearly reaches m obtained for cattle sold as meat.

It would be interesting and instructive to compare these figures w similar estimates for say two decades back, but unfortunately this ca be done, such returns not being available. What has happened, how in recent years is that dairy farming has steadily been taking the pla corn growing, and arable land has been turned into pasture to suit altered class of farming, thus resulting in an ever decreasing area of cult ted arable land.

Where corn growing has not been found to pay, dairy farming generally been substituted, and it has also largely taken the place of fat ing cattle — a class of farming which has not been very remunerativ recent years, owing to the large importation of foreign and colonial m that has come into operation.

Now whilst the importation of butter and cheese from abroad lar influences the value of these commodities as produced in Great Bri there is practically no importation of milk to affect the value of the milk trade. The populace of Great Britain, whilst existing and b dependent chiefly on foods imported from abroad, is fortunately abl obtain a supply of home-produced milk to meet its requirements i Small quantities of fresh milk are imported from countries within reach of the British Isles, but the quantity is negligible and the trad present shows no prospect of developing.

Milk selling has been described recently as the sheet anchor of English farmer, and certainly it has assisted him to an extraordi extent when other systems of farming have failed. He realises tha is free from the competition created by imports from abroad that e in the case of most other commodities, and thus is able to develop his t without the fear of having to compete with others who can produce at cheaper cost. The retail price in towns varies from 1*s* 2*d* to 1*s* 4*d* per ga In many large towns up to within about four years ago milk was so 1*s* per gallon all the year round, but it is now generally sold at 1*s* in sum and 1*s* 4*d* in winter, making an average price of 1*s* 2*d*, though in man the large towns it does not vary from all 1*s* 4*d* the year round and 1*s* 8 gallon is charged for the best class trade in London.

Generally speaking the wholesale price of milk throughout the co may be taken as about 7½*d* per gallon net to the farmer throughou year after the freight charges have been deducted. About 8 ½ is obtained in the winter and about 6 ½ *d* net in the six summer mo The cost of transport in the country generally may be taken as 1 gallon which conveys the milk up to 100 miles. Comparatively little travels short distances so as to secure the ½ *d* per gallon rate conveys it for 20 miles.

It is not the same with the butter and cheese trade, however these have to compete with imports from very many parts of the The imports of butter into Great Britain are valued at £24 00 and those of cheese at £7 000 000, which totals more than the amount realised for milk, cream, butter and cheese produced in the co The cost of production in most countries from which butter and

ceived is much less, owing to cheaper land, cattle, feeding, etc ; hence velopment of the milk trade in Great Britain at the expense of the facture of cheese and butter, as shown in the figures previously quoted. he question arises as to what is being done to cope with the increased id for milk and the possibility of the demand being greater than the . As previously mentioned, more and more arable land is being con- into pasture, which is the main requirement for dairy farming ; part from this must be considered the number of stock capable of carried by the total amount of land available. Farming in Great n is still regarded as one of the less important industries, though are many movements on foot at the present time to make it more tive and to increase the area of land available for agricultural pur- by bringing under cultivation soil which at present is more or less luctive. If, however, these points are left out of consideration and assumed that the present available land is carrying practically all ock it is capable of doing, which we think is by no means the case, s still a means of increasing milk production. This is by means of sing the yielding capacity of the dairy cows, or, in other words. ng special attention to breeding and selecting animals for high of milk. A great deal of work is now being done in this direction by individual dairy farmers and public bodies—work that ten years erited but little attention. If the average yield per cow, as is estim- or Great Britain, is only some 350 to 400 gallons, then it follows much improvement is possible. Milk records are being carried out ious County Councils and Dairy Associations (1) the results of which he quantity and quality of the milk yielded annually by each indiv- cow in the herd, and this information enables the farmer to retain he cows which give satisfactory results.

Scotland a number of Dairy Societies have been started and have n operation some five or six years, with the result that Milk l Schemes of great value have been obtained and much growth in being continued. It is found that in most herds the variation in nual yield per cow is great, for whilst the poorest animal may give llons or less the best may be yielding 1 000 or perhaps more. Now st of keeping and tending an animal yielding a large quantity of oes not much exceed that of a poor cow ; hence if only good cows ed capacity are kept, as much as 50 per cent. more milk may be ed from a similar number of cows.

ost dairy farmers, even men who have been engaged in the work ny years, seldom know the milk yield of each cow in their herds, ilk records have shown as wide a difference between two herds on ng farms as 200 gallons per cow. Thus the farmer whose herd ave- 00 gallons per cow per annum, may look forward by exercising selecting his cattle to increasing the yield to 800 in the course of a ars.

See No. 1439, *B*, Oct. 1912. (*Ed.*).

Numerous dairy farmers, however, do not breed their own stock, b instead buy cows which they retain for one, two or three years and th sell them off fat to the butcher. The calves of such animals are usua also sold to the butcher, and this system of dairy farming tends to red the quantity of milking stock in the country and many of the best dairy co are thus lost. Such may be considered a very extravagant method dairy farming, and to the farmer in this case milk records do not appe as he does not keep his cows a sufficient length of time and does not rea any of the progeny, even of the best ones.

The favourite breed of Dairy cattle throughout the country is the Du Shorthorn — an animal of Shorthorn type but not of pedigree strain. An animal of this class may be valued at from £18 to £25.

The factory system of dairying is not extensively carried on in Gr Britain, but in Ireland there are a very large number of Creameries, a butter-making on Danish methods is practised. In England the large cen of population require the milk for consumption, but in Ireland there but few large towns and their requirements of new milk are limited, all ing for an extensive manufacture of butter. Where factories exist in Gr Britain they usually engage in all branches of the dairy industry, sel milk to the towns whenever possible and making cheese and butter. T former generally gives better returns than converting the milk into d products, hence the manufacturing periods are chiefly when milk is plen and the markets overloaded. Of course in many cases there are facto where cheese or butter is manufactured and milk selling not undertak but these are becoming fewer and exist chiefly in the more isolated distri The greater part of the butter and cheese produced is still made the farms, but even this is rapidly changing and where farmers form manufactured the milk at home they are commencing the sale of the n

A number of factories on co-operative lines are being establis Such factories, started and run by the farmers themselves, are provi very satisfactory means of regulating the milk trade, as when there surplus of milk it need not be placed on the market and so lower prices. can be converted into cheese and butter. Further, where the milk is ma factured at a factory it is possible to produce an article of more unif quality than is the case at individual farms, and the smaller dairy farm are thus enabled to obtain a better return for the milk produced on t holdings.

Whilst it is still a fact that the finest quality butter and chee produced at the best farms, it is nevertheless true that the bulk comp very unfavourably in quality with that turned out from the factory w skilled labour and scientific methods are in vogue. Much expendi has been made in teaching butter and cheese-making for many years p and doubtless some general improvement in farm-made dairy prod has resulted, but on the whole the return has been small in propor to the expenditure involved. It has indeed become generally recogn that it is better for a group of farmers to start a dairy together, prop equip it and employ the best skilled labour rather than continue the m

re of dairy products at home. Better means of marketing are possible
enerally better financial returns are the result.
For the protection of the public, various laws affecting the production
ale of milk have been put into operation recently and further re-
ions on the sale of milk will come into force when what is known as
urns' Milk Bill at present before Parliament becomes law. Parliament,
many years of apathy, has become alive to the needs that the nation
f supplies of pure wholesome milk. It doubtless realises that the
l of the nation depends greatly upon supplies of pure milk, especially
lk has now become so commonly used in the daily dietary of the
majority, and moreover it is the chief food of children who need most
tion.
ollowing upon the reports of the Royal Commission on Tuberculosis,
investigations and findings during the last twenty years have shown
uberculosis or consumption in human beings is largely caused by tu-
ous milk and meat, an order came into force on May 1st by which
erculous cattle must be notified. Such cattle are to be examined
terinary Inspectors appointed by the County Councils, and on their
mendation all obviously tuberculous animals and cows suffering from
ulous udders will be slaughtered, compensation to the extent of one
r of the estimated value of the animal being paid to the farmer where
ed tuberculosis is discovered. Where tuberculosis is manifest but not
ed three quarters of the value will be paid—in each case half the
the valuation and examination to be deducted.
his is an important move in protecting the public, especially children,
uberculous milk and meat, as unfortunately a fairly large percentage
rculous milk is now marketed ; indeed some recent figures of exten-
alyses made of London's milk supply showed no less than 10 per
f the supply as containing the tubercle bacilli. Municipal author-
an exercise powers to prevent the entrance of milk in towns from
rce when it is proven to be tuberculous, but such powers are seldom
Whilst the Tuberculosis Order will doubtless in a few years result
killing off of most badly tuberculous cattle, there will still remain
imals that are apparently healthy but are really tuberculous as
by the tuberculin test. In several instances private enterprise has
ed upon the supply of milk solely from cows which have passed
erculin test and are kept periodically tested, which is the only
y of obtaining a milk supply guaranted free from tubercle germs.
is alone is not the only part of the scheme, as if milk is obtained
om healthy cows it must not be allowed to get contaminated from
infection afterwards and before it reaches the consumer, and to
t this it must be handled and distributed under proper hygienic condi-
There is a minimum Government standard of quality which speci-
t if milk contains less than 3 per cent. of fat and 8.5 per cent. of
ot-fat it is presumed, until the contrary is proved, that the milk is
ted.

The law also prohibits the use of any chemical preservative whatever in milk, though harmless colouring matter is not debarred. Recently too the use of preservatives in cream has been restricted and it is now illegal to add any preservative whatever to cream containing less than 40 per cent. of fat. If cream containing over 40 per cent. fat is preserved, only boracic acid, and hydrogen peroxide are permitted to be used, and all receptacles in which such preserved cream is sold must have affixed to them a label printed in letters of a specified size varying with the size of the vessel, stating the preservative used, and if borax or boric acid or both be present, the percentage expressed in terms of boric acid must be stated on the labels. Restaurants and Refreshment Rooms serving preserved cream are required to display notices to this effect.

Appendix.

TABLE I. — *Number of churns of milk delivered daily at London railway stations by the various railway companies in* 1907

	No.
Great Western Railway	3 999
London and South-Western Railway	2 477
London and North-Western Railway	1 670
Great Northern Railway	1 153
Midland Railway	1 094
Great Eastern Railway	952
London, Brighton & South Coast Railway	941
South-Eastern & Chatham Railway	377
Great Central Railway	175
North London Railway	122
Metropolitan Railway	50
West London Extension	16
Total	13 026 churns

or 13 026 × 17
= 221 442 gallons

Approximately therefore the amount of milk reaching London daily by rail 221 442 gallons and the quantity brought to London by road or produced in London small.

The North-Eastern Railway Company has kindly supplied the following figures the imports of milk into Newcastle during 1911: estimated number of gallons 1 959 As this City has a population of 266 603 this means roughly 7.3 gallons per head, should be taken into consideration that the milk arriving by rail is by no means all milk received in Newcastle, as a large number of farmers in the district convey to retail milk in the City.

BLE II.—*Quantity and value of cheese exported to each country from the United Kingdom in the year* 1912.

Countries to which consigned	British and Irish Produce		Foreign and Colonial Produce	
	Cwts	£	Cwts	£
. . . . .	149	704	*	—
ay	604	2 785	905	3 235
. . . . .	475	2 137	1 255	4 662
. . . . .	134	595	*	—
. . . . .	118	540	960	3 438
States of America	592	5 291	141	420
. . . . .	186	864	*	—
. . . . .	277	1 255	12 426	49 100
ands	*	—	320	973
l	*	—	2 359	8 363
l	*	—	5 037	20 820
. . . . .	*	—	883	2 754
ne Islands and Guam . . .	*	—	2 049	7 422
. . . . .	*	—	204	673
oreign countries	1 061	5 286	3 547	12 802
al to foreign countries . . .	3 596	19 457	30 086	114 662
Islands	322	1 216	2 988	9 720
Good Hope	334	1 511	13 017	40 152
. . . . .	146	710	5983	18 231
India	2 181	10 126	1 880	8 313
l	115	740	**	—
West Indies	314	1 564	**	—
. . . . .	**	—	2 053	7 321
nd Gozo	**	—	2 651	9 307
d	**	—	8 021	25 978
ritish Possessions	1 534	7 547	2 618	10 971
l to British Possessions . .	4 946	23 324	39 211	130 513
Total . . .	8 542	42 781	69 297	245 175

cluded (if any) in other foreign countries.
cluded (if any) in other British Possessions.

TABLE III. — *Quantity and value of butter and cheese imported into the United Kingdom from each country in the year* 1912.

Countries from which consigned	Butter		Cheese	
	Cwts.	£	Cwts.	£
Russia	683 650	5 656 742	*	—
Sweden	335 014	2 113 871	*	—
Norway	30 634	192 183	*	—
Denmark (inc. Faröe Islands)	1 618 048	10 356 001	*	—
Iceland and Greenland	3 973	21 264	*	—
Germany	2 355	12 221	*	—
Netherlands	113 716	641 638	268 286	701
France	246 652	1 559 452	16 030	56
Italy	1 534	8 560	91 060	306
United States of America	2 596	15 250	21 227	66
Argentine Republic	67 244	396 964	*	—
Belgium	*	—	442	1
Switzerland	*	—	12 226	41
Other foreign countries	119	657	1 579	4
Total from foreign countries	3 105 535	18 974 803	410 890	1 178
British India	924	3 559	**	—
Australia	549 396	3 225 886	1 408	4
New Zealand	349 012	2 148 192	543 917	1 882
Canada	27	145	1 452 570	4 347
Other British Possessions	265	1 608	2	
Total from British Possessions	899 624	5 379 390	1 897 897	6 233
Total	4 005 159	24 354 193	2 308 787	7 411

* Included (if any) in other foreign countries.
** Included (if any) in other British Possessions.

SECOND PART.

ABSTRACTS

AGRICULTURAL INTELLIGENCE

GENERAL INFORMATION.

Legislation for the Protection of Moors in Germany. — *Landwirtschaftliches Wochenblatt für Schleswig-Holstein, amtliches Organ der Landwirtschaftskammer*, Year 64, No. 18, pp. 405-406. Kiel, May 1, 1914.

The law of March 4, 1913, for the protection of moors in the province Hanover has been extended (April 1, 1914) to the provinces of Pomerania and Schleswig-Holstein.

The object of the law is to prevent the uneconomical exploitation of moors. It prescribes that plots of land which alone or with others form a compact area of moor more than 25 ha. (62 acres) in extent, so far as public interest requires it, can only be worked for peat in such a way as to leave their further profitable use for agriculture or forestry.

The use of such plots for cutting out of peat requires the authorization of the district committee, for which an application has to be made. Before granting the authorization a competent office to be nominated by the Minister of Agriculture, Domains and Forests has to be consulted, as well as the Improvements' officials. If requested, an expert named by the applicant has also to be heard. Against the decision of the district committee the applicant may appeal within two weeks to the Minister of Agriculture. Undertakings which had already begun cutting out peat before the law did come into force may continue to work for six months longer without being subject to the limitations of the new law.

The authorization to cut out peat is not required when the peat is cut in the household or farm of the owner, farmer, or person entitled to cut peat or of an agricultural labourer under permanent engagement to the owner of the peat bed, when his agreement authorises him to cut peat for his own household or farm. Further the authorization is not required when the peat is cut for sale, provided such cutting be conducted by not

more than six persons and without machinery. The district police, ho ever, may issue regulations with regard to peat cutting in order to g guard the interests of agriculture or forestry.

699 – **Experiments with Plots of Different Sizes** (1). — SCHNEIDEWIND, in *Mitteil der Deutschen Landwirtschafts-Gesellschaft*, Year 29, Part 21, pp. 298-300. B May 23, 1914.

Experiments have been undertaken at the experimental farm Lauchstädt, with the object of comparing the yield from different sized differently arranged plots, and the influence of manuring on the respec yields. The plots have been laid out on a very uniform piece of land, and experiments, which are to be continued for a considerable time, are arran as follows.

I. 30 plots of 9 sq. metres (10 3/4 sq. yds.) each, adjoining one ano without intervals.

II. 20 plots of 9 sq. metres each, in the form of a square with an planted margin 80 cm. (31 in.) wide all round.

III. 18 plots of 100 sq. m. (120 sq. yds.) each adjoining one anot without intervals, and without any unplanted borders.

IV. 6 plots of 200 sq. m. (240 sq. yds.) each, but otherwise resemi Group III.

In 1913 sugar-beets were sown on the plots. One row of plot each of the four groups received 1.6 cwt. and one row 3.2 cwt. of nitra soda per acre, while the third received no nitrogenous manure.

The returns are only complete for Groups I, II and IV. The yie the plots with borders round them (Group II) was, in the "unmanu cases, superior to that of Groups I and IV (without borders) by ab tons an acre of fresh roots.

The nitrogenous manure had less effect on the plots with bor where more nitrogen and moisture were available for the plants on acc of the free space, than on the other areas : while 3.2 cwt. of nitrate of per acre produced on the Group I plots an increase of about 2 tons of an acre, and on those of Group IV an increase of about 37 cwt., a si dressing only gave an increase of 23 cwt. on the plots with borders. results obtained from the 1.6 cwt. per acre dressing of nitrate of so not agree satisfactorily with the above.

700 – **The Work of the Buitenzorg Botanic Gardens for 1913.** — DE JONG, A in *Mededeelingen van het agriculturchemisch laboratorium*, No. VII, pp. 1-4 tavia, 1914.

The experiments carried out at the Botanic Gardens in Buite during 1913 led to the following conclusions.

1. Earthnuts ploughed in green not only increase the follo rice crop but also the next earthnut crop taken after the rice.

2. The largest increase with manioc was obtained when com manures were used, but nitrogenous manures alone were almost as effi

(1) See No. 795, *B.* July 1913.

3. No increase was obtained in crops of sweet potato, lemon-grass arthnut when dung was added to potassic fertilizers.

4. Earthnuts grown continuously on the same field appear to be- more resistant; the number of dead plants gradually diminishes.

Formation of an Agricultural Office for Tripoli. — *Bollettino di Informazioni dell'Ufficio Economico del Ministero delle Colonie*, Year II, No. 4, pp. 271-273. Rome, April 1914.

The Royal Decree of March, 1914, instituted an Agricultural Office in li for the purpose of carrying out experiments of a technical and econo- nature in that country and to study the means of encouraging the e agriculture and colonisation. The office comprises:

a) an experimental section, technical and economic;

b) an administrative section;

c) a section including the meteorological, engineering, statistical ther departments necessary for the development of the Office.

The staff of the Office may be chosen from amongst Civil Servants or private individuals possessing the required qualifications and will ade up as follows:

	No.
Director	1
Heads of the administrative and technical departments	2
Technical experts	4
Secretary	1
Laboratory assistants	1
Field men	4
Labourer	1
Porter	1

accordance with the suggestion made by the Commission appointed tigate the agricultural conditions of Tripoli, the Minister of the Colo- decided to let experimentation precede demonstration and the giv- dvice, with regard to both technical and economic questions. The ector to be appointed to the office is Prof. DE CILLIS, from the Royal ural College at Portici, Naples, and he will also form part of the nent Commission for investigating the agricultural conditions of

gricultural Shows.

ed States.

. 7-17. Wichita (Kansas). — International Soil-Products Exposition, held on the occasion of the Ninth International Dry-Farming Congress.

gricultural Congresses.

y.

t. 24-29. Milan. — Third National Congress of Applied Chemistry. Dr. Vicentini, Via Marsala 8, Milan.

ted States.

t. 7-17. Wichita (Kansas). — Ninth International Dry-Farming Congress. Secretary: Ralph H. Faxon, Wichita, Kansas.

CROPS AND CULTIVATION.

704 – **Separation of Soil Particles according to their Specific Gravity, and Relations between Plants and Soils.** — KÖNIG, J. (Report from the Agricultural Experiment Station at Münster-in-Westphalia), in *Landwirtschaftlicher Jahrbücher*, Vol. XLVI, Part 2, pp. 165-251. Berlin, 1914.

I. *Separation of Soil Particles according to their Specific Gravity.*

The writers have separated out the constituents of seven soils by m of liquids of different specific gravities; the liquid used was a mix of bromoform and benzol, which may be considered as without actio soils. The separation was carried out at first by shaking followe settling till the liquid was clear, the floating particles remaining at surface and the remainder at the bottom; subsequently an improve was made by centrifuging the liquid for 10 minutes instead of allowi to stand. Altogether four of the mixed liquids were used, with s 2.36, 2.49, 2.55 and 2.64, giving five soil fractions. Two of the soils clay and the other schistose) could not be separated by shaking and set in the case of the schistose soil owing to the constituents being practi uniform; it was also found that organic material adhered to the he particles and could not be separated even by continued shaking. the help of the centrifuge the separation was better, and even the cla schistose soils could be dealt with.

Physical and chemical examination of the five fractions led t following general conclusions:

1. The facility or otherwise of the separation is an indication heterogeneity or homogeneity of the soil. The clay gave none of th heaviest fractions (I and II) even on centrifuging, while the li (fraction V) amounted to only 1.08 per cent. Of other soils, those co ing plenty of humus and colloids give considerable amounts of the l fractions, whilst preponderance of the heavier fractions indicates lacking in humus and therefore of low fertility.

2. Fraction I (S. G. more than 2.64) is almost lacking in in the sand, the loamy sand, the loam and the calcareous soil it do exceed 1 per cent., while in the schistose soil it reaches 7.3 per cen consists largely of silicate fragments.

3. Fraction V (S. G. less than 2.36) contains large quantit organic matter, as well as the bulk of the colloids and nutritive subs of use to plants.

4. It should be noted that fraction V (or in general the fr containing most nutritive material) also contains the largest amo silicic acid, iron oxide and alumina, *i.e.* colloids; the humus is so inti connected with these minerals that it cannot be separated from mechanically. This tends to support the view arrived at in p work that the humus in the soil is present, at any rate in part, in th of complex humate-silicates.

5. Comparison of the five fractions shows that in all four soils exa- d in detail (sandy garden soil, calcareous soil, loam and sand) there is most regular rise in the relative amount of nutritive material from V or at any rate from II to V.

8. The distribution of clay (*i.e.* the portion of the soil freed by sul- c acid) in the different fractions varies with the type of soil.

II. *The Relations between Plants and Soils.*

Culture experiments have been in progress since 1904 in connection the work on the investigation of the soil (1), especially with a view termining the relation between the amount of dry matter produced such properties of the soil as catalytic energy, nutritive material by oxidation, or by steaming under pressure, osmotic pressure, colloid ut and oxidizing power. Six types of soil (sand, schistose soil, clay, calcareous soil, and sandy loam) were used, and the experiments made both in the open and in pots under glass.

During these investigations the following points were elucidated:

1. The plants grown in pots under glass generally gave higher yields given area than those growing in the open, but the difference in the iments was not so great as in many conducted elsewhere.

2. In hot dry summers, the absorption of minerals, particularly horic acid, may be much greater than in cool rainy ones, but this is ecessarily associated with increased production of dry matter. The sed absorption of phosphoric acid in hot dry weather is no doubt due reased oxidation, and consequently increased solubilisation, of the horic acid in organic combination, owing to increased penetration into the soil.

3. The relations between the principal nutritive elements absorbed ie dry matter produced are shown in the accompanying table:

Conditions of experiments	Parts of dry matter produced for 1 part of:					
	Nitrogen		Phosphoric acid		Potash	
	Limits	Average	Limits	Average	Limits	Average
average for six soils { under glass	59–65	62	—	177	38–86	69
average for six soils { in the open	57–62	59	137–176	161	36–57	48
very good garden soil	31–67	49	79–153	109	30–83	47
s experiments under various con- s	30–82	57	92–272	169	29–94	61

or lime, the ten-year averages gave figures ranging from 61 to 100, e 83. It appears that the following values may be used for determin-

Published in *Landw. Versuchs-Stationen*, 1907 to 1913.

ing the necessity of manuring for any particular soil (using averages the various crops):

	Relative dry-matter value: Minimum below which manure is not required	Maximum above which manure is required
Nitrogen	50	62
Phosphoric acid	100	170
Potash	47	60

Individual crops show marked deviations, as shown by the following values for potash:

Cereals	73
Potatoes	38
Red clover	37
Mangels	29

For lime, red clover gives a value of 31, while the average of other field crops is 126.

4. The general relations of the four nutritive materials to one another in the dry matter of plants are:

N	P_2O_5	K_2O	CaO
100 :	35 – 40 :	130 — 140 :	75 — 80

Here again there are deviations for individual crops, in particular Leguminosae; thus the P_2O_5 per 100N is only 19 for red clover against 44 for the other crops and 56 for mangels.

5. The sum of potash + lime is fairly constant, being 3.0 to 3.5 per cent. of the total dry matter.

6. Unbalanced manuring with potash and phosphates, in soils requiring these elements, and especially in time of drought, may reduce the amount of dry matter produced.

7. In all the soils except the sandy loam, very good correlations have been established between the amount of dry matter produced by plants and the following chemical or physical properties of the soil:

a) amount of ammonia absorbed (Knop);

b) amount of potash and phosphates absorbed (M. Fesca);

c) hygroscopicity (A. Mitscherlich);

d) absorption figure for methyl-violet;

e) osmotic absorption of water;

f) electrolytic conductivity (the last three in the Münster investigations).

8. The best method for determining the amount of potash available for plants is steaming the soil for 5 hours under a pressure of 5 atmospheres. In the individual experiments as well as in the 10-year average the amount of soluble potash down to a depth of 6 to 8 in. determined in this way was very near the amount taken up by the plants.

It may be concluded that soils giving only 5 mgms. of potash soluble in this way per 100 gms. of soil require potash manuring, while

ning more than 8 mgms. do not require it. Here again, of course, lual crops vary, beets and clover taking more than the amount ered " available ".

9. The " available " phosphoric acid determined by various methods ot show any close agreement with the amount taken up by plants: ears that the higher the content of the soil in lime, magnesia, iron and alumina, the more difficult is the absorption of phosphoric acid. er and plant-species are also of importance. At the same time it e said that soils giving less than 4 mgms. of phosphoric acid per ıs. of soil by the steaming method, require phosphatic dressings.

10. For nitrogen and lime no definite relation between the absolute ty in the soil and the quantity absorbed by plants has been de- ed.

11. Application of either the electrolytic conductivity or the steam- der pressure method before and after the culture period is useful ermining the amount of nutritive material removed from the soil plant. In these experiments, the amount of phosphoric acid taken ged from 23 to 34 per cent. (average 29 per cent.) of that in a soluble on after steaming.

locks and Soils in their Relation to the Nutrition of Plants. — BLANCK, E. in *landwirtschaftlichen Versuchs-Stationen*, Vol. LXXXIV, Part V and VI, pp. 399-425. 'n, 1914.

e writer has carried out vegetation experiments with eruptive rocks ystalline schists having the following percentage composition:

	Quartzite schist	Porphyry	Granite		
			1	2	3
. . . . .	92.611	76.552	73.499	73.752	74.399
. . . . .	5.093	12.145	14.565	13.838	14.065
. . . . .	0.520	1.720	3.086	3.566	2.166
. . . . .	0.287	0.893	1.733	1.866	1.267
. . . . .	0.607	0.673	0.386	0.720	0.833
. . . . .	—	4.806	3.466	3.900	4.660
. . . . .	—	2.346	3.946	3.733	3.380
. . . . .	traces	distinct traces	distinct traces	distinct traces	distinct traces
gnition.	0.840	1.540	0.466	0.360	0.567
	99.938	100.675	101.147	101.735	101.337

e material used in the experiments consisted of unweathered rubble mes from the quarry. It was then crushed so that it resembled less fine-grained groats and in this form it was placed in the culture ls experiment plants, oats and peas were used. No manure was

given, except 0.1 gm. of ammonium sulphate for the oats. The received a solution of soil in which peas had grown, so as to inoculate nodule bacteria. Thus the action of any artificial manure on the co nents of the rocks may be said to be practically non-existent.

The results of the experiments are summarized as follows by the ter:

1. The four igneous rocks examined, namely three granites a porphyry, proved superior to the quartzite schist in the crop of oats peas, but the plant food contained in the quartzite schist was much utilized than that contained in the igneous rocks.

2. These experiments have demonstrated that mica-potash, cially biotite-potash, is much more accessible to plants than the potas felspar.

3. Sandstones, according to previous experiments made by the ter, are much more suitable for the growth of plants, both for the amo of yield and for the utilization of the plant food, than quartzite s granite or porphyry.

706 – **A Further Case of Soil Sterility in the Dutch East Indies.** — LEDEBOER and BERKHOUT, A. E. in *Mededeelingen van het Proefstation voor de Java-Su dustrie*, Year XXII, No. 18, pp. 653-672. Surabaya, May 1914.

Soil sterility due to the presence of excessive quantities of chl and sulphates is a well-known phenomenon in the Dutch East Indies salts are probably derived from flooded craters; but a case of ste has recently been investigated from the Pemalang district which rev the presence of large quantities of soda mostly in the form of carbo the percentage being much higher than that given by O. MAIOR (1) sodic soils at Sipote (Jassy). This large quantity of soda accoun the curious character of the Java soil: when it rains the soda forms ad tion compounds with the soil colloids, thus producing hydrogels, then out very slowly, undergoing such a large decrease in volume that c appear at the surface.

Manurial experiments have already proved that the addition per cent. of quicklime produces a wonderful improvement, while the tion of 3.6 per cent. injures the vegetation but completely change structure of the soil, as the lime displaces the soda in the colloidal comp and causes flocculation. Gypsum employed in similar cases in Au and India gave even better results, as the sulphuric acid formed ne lizes the alkali which is injurious to plant roots.

Analyses of subsoil water revealed a content of 492 mgm. of so carbonate per litre, showing that the soda comes from the subsoil.

707 – **Relations of Certain Higher Plants to the Formation of Nitrates in S** LYON, T. LYTTLETON and BIZZELL, JAMES A. in *Cornell University Agricultural E ment Station, Memoir* No. 1, pp. 9-109. Ithaca, N. Y., 1913.

The relation of timothy grass to the nitrogen content of the so been studied for six years at the Experiment Station at Cornell Unive

(1) Die Salzböden Rumäniens, *Kühn Archiv*, Vol. I, p. 426.

1907, 1908 and 1909 nitrate determinations were made of samples taken from field plats under timothy, maize and oats in rotation. ults obtained were no doubt considerably influenced by the heavy il, which made the movements of nitrates very slow and hence ized the relationship between the plant at any particular stage of and the nitrate content of the soil.

ch plat was divided into sections, of which one was always kept bare eived the same soil treatment as the planted sections of the plat, rmitting a constant comparison of the nitrates in the planted and planted sections.

was found that : 1) The nitrate content of soil under timothy, maize, s, oats, millet and soy beans was different for each crop when on ie soil and there was a characteristic relationship between the crop nitrate content of the soil at different stages of growth.

2) During the most active growing period of the maize crop, nitrates equently higher under maize than in cultivated soil bearing no id under a mixture of maize and millet, nitrates at this period were than under millet alone, although the crop yields were about the l both plats.

3) Under both maize and oats the nitrate content was higher dur- period when the crop was making its greatest draft on the soil l than in the later stages of growth, but under these crops and under here was no increase in nitrates late in the season when nitrogen ion had practically ceased, although uncropped soil showed a very crease in nitrates at that time.

4) Changes in the moisture content or in the temperature of the r early summer had no important effect on the nitrate content oil under crops.

ese phenomena may be accounted for on the assumption that ni- rmation is stimulated by some processes connected with the active and absorbing functions of some higher plants, particularly of This, together with the fact that the maize plant probably ob- large part of its nitrogen in some form other than as nitrates, would for the very high nitrate content of the soil under maize. The ces in the production of nitrates below different crops would be ed for by supposing differences in the stimulating or inhibiting es on nitrification, as well as in the relative rates, amounts and forms gen absorption.

e nitrifying power of the soil under different conditions of cultiva- s determined by incubation with dried blood.

was found that : 1) The rate of nitrification of alfalfa soil was greater at of timothy soil ; this effect was maintained for two years after l of the crop.

2) There is a distinct relation between the nitrifying power of a soil nature of the crop previously grown.

3) Nitrates were most abundant after a maize crop, the next highest fter a potato crop and the least after oats.

4) Freezing and thawing renders the soil more favourable to r formation, but it is not known if this effect is due to the cold readj the equilibrium of the bacterial flora, or overcoming the depressing ence of some previous crop.

5) Timothy grass maintains a lower nitrate content in the soi any other crop, and mixed grasses gave much less nitrogen in th and drainage water combined than was found in the drainage wate unplanted soil. This would suggest a possible explanation of the inj effect of grass sod in orchards in which the supply of nitrogen is de The influence of a crop on nitrification may be an important fac crop rotation also.

708 – **Chemical Composition of Moor Hay provoking Excessive Licking in** — *Communication from* HJALMAR VON FEILITZEN, *Director of the Experimen of the Swedish Moor Cultivation Union.*

A former field agent of the Swedish Moor Cultivation Union re that hay from a meadow sown down on fen land had proved inj as winter fodder for cows : they lost their appetite and fell off in con some even having to be slaughtered.

An investigation of the fen in question was made by the Statio first cut had given 2 tons of hay per acre, although the farmer had it only a light dressing of manure: 1 ¼ cwt. per acre each of super per cent. potash salts. Samples were taken from the injurious part 1912 hay, as well as from a fen hay and a mineral-soil hay of the 191 unfortunately no 1912 hay from a mineral soil could be had.

A botanical examination showed no marked differences : all samples consisted of nearly pure timothy (97.6t o 97.8 per cent.). little smooth-stalked meadow grass, red fescue, fiorin (*Agrostis*) and fe the hay from the mineral soil contained some red and alsike clover cent.). The fen hay contained one or two pieces of *Potentilla erecta*, *saxatilis* and *Spiræa Ulmaria*. The only marked feature of the fe was the presence of a few brown tips to the leaves.

A thorough chemical analysis was made, comprising determi of fat, crude fibre, crude, pure and digestible protein, lecithin, ash c tuents (iron oxide, alumina, lime, magnesia, potash, sodium, phosphori sulphuric acid — also sulphur in organic combination — and chlo but no defect was found in the fen hay. Naturally the total ash was l in the hay from mineral soil ; the fat content was also somewhat hi fibre was rather more in the fen hay, no doubt owing to later cu Protein was highest in the 1912 fen hay, rather lower in the 1913 sa digestible protein was also highest in the 1912 sample provoking " sucht " (excessive desire to lick) ; indeed the feeding value shown by an was better in this than in the hay from mineral soil.

Of the individual ash constituents, potash was lower in the fen hay in the mineral-soil hay ; a heavier dressing of potash would have advisable, but that insufficient manuring cannot have caused the to is shown by the fact that the normal 1913 fen hay contained even less p than the 1912 sample. The " Lecksucht " hay contained conside

sodium than either of the other samples, but this cannot be considered advantage since it is usual to add salt to the rations. The phosphoric was very low in all three samples (in hay with 15 per cent. moisture, 0.177 and 0.293 per cent., as compared with 0.35 to 0.40 per cent. in al Swedish hay samples), so that this cannot have been the cause; hosphorus in organic combination as lecithin and other phosphatides very low (0.014 and 0.012 per cent. P in the fen hays, and 0.020 in ineral-soil hay), but here again the slight differences are of no signi- e on such small quantities. Of the other constituents, only chlorine her high in the "Lecksucht" hay (1.05 per cent. against 0.42 and 0.50), his of course goes with the high sodium content.

omparative chemical analysis therefore shows no reason for the in- s properties shown by this particular fen hay.

Tillage Experiments in Algeria (1). — *Bulletin de l'Office du Gouvernement énéral de l'Algérie*, Year XX, No. 11, pp. 178-179. Paris, June 1, 1914.

illage experiments were carried out at the Agricultural School of n Carrée in 1913, and it would appear from the results that no advan- was gained by subsoiling the land the previous autumn; in fact, in cases the crops of hard wheat obtained on the subsoiled plots were or to those on the control plots.

Trials of the Zehetmayr Method of Drilling Cereals carried out in Swe- n (2).— RHODIN, SEGURD in *K. Landtbruksakademiens Handlingar och Tidskrift*, ar LIII, No. 2, pp. 94-105. Stockholm, 1914.

he Zehetmayr method of drilling consists in planting the seed at the m of small furrows which serve as a protection during the winter re flattened out in the spring by means of a special harrow. Trials s method at the Central Agricultural Institute in Sweden did not he good results expected; in fact in many cases the yield was lowered this method was adopted. The failure is probably due to the mecha- condition of the rather heavy soil, a fine tilth and free working soil necessary in order that the drill should work satisfactorily.

The Influence of Lime as Quicklime and Carbonate on the Physical Con- ion of Various Soils. — ENGELS, O. (Speyer Agric. Exp. Station) in *Die landwirt- aftlichen Versuchs-Stationen*, Vol. LXXXIII, Part 5 and 6, pp. 409-466. Berlin, 1914.

xperiments have been carried out as to the effect of lime in a number es of soils: in each case soil treated with 1 per cent. of quicklime ompared with that receiving 1 per cent. of calcium carbonate and ntreated soil.

leasurements were made of the various physical properties. In l quicklime had a more marked action than the carbonate; the in- in water capacity, permeability, hygroscopicity and friability and ecrease in contraction on drying were greater in soils containing clay, whereas the decrease in capillarity due to liming was greater sandy soils.

(1) See also No. 1707, *B.* June 1911; No. 2098, *B.* July 1911. (*Ed.*)
(2) See No. 1272, *B.* April 1911; No. 403, *B.* April 1913. (*Ed.*).

712 – **Influence of Straw on the Utilization of the Organic Nitrogen of M**
— VON MAY, F. in *Mitteilungen der landwirtschaftlichen Lehrkanzeln der h. k. k.*
schule für Bodenkultur in Wien, Vol. II, Part 3, pp. 433-454. Vienna, May 1

On the effect of straw as a manure there are a great number of p
in agricultural literature. In most cases experiments on the subject h
shown that manuring with straw is followed by a diminution of the c
after which some increase may be observed in the succeeding year. M
of these experiments have been carried out in pots or on very small p
in the open. The writer has sought as far as possible to carry out
experiments under field conditions.

The two experiments here reported upon dealt with the behavi
of the plants immediately after being manured; their results are su
marized by the writer as follows: The utilization of a given quantity
organic nitrogen by plants grown immediately after an applicatio
manure suffers a depression when a substance lacking nitrogen (in this
straw) is added. The magnitude of this depression depends principally o
the ratio between the available nitrogen and the nitrogen-free orga
matter, which in its turn depends upon the ratio between the compos
of the manure and the quantity of nitrogen in the soil. The more
ratio varies in favour of the nitrogen-free matter the greater the depres
and under the same circumstances those plants which require their nitro
in the shortest time suffer most. The cause of this fact is attributed
the withdrawal of soluble nitrogen by the micro-organisms of the
which avail themselves of the nitrogen-free organic matter as a source
energy.

713 – **On the Action of Sulphate of Ammonia and Superphosphate of Am**
in Calcareous Soils. — WŁODECK, J. (Institute of Agriculture of the Jagiell
versity, Cracow) in *Odbitka z czasopisma Kosmos zeszyt* 10-12 *r. r.* (Article in Ger
Lemberg, 1913.

Two field experiments were made on calcareous and sandy soi
the Experiment Farm of the Jagielli University, of Cracow, to deter
the losses of nitrogen in manuring with sulphate of ammonia and to
the effect of superphosphate of ammonia in calcareous soils. The p
used in the experiments were cereals.

When the crops obtained in these experiments on calcareous
sandy soils are compared with those obtained by the use of nitrate of
taken as 100, the following ratios are obtained:

	Calcareous soil	Sandy so
Nitrate of soda	100.00	100.0
Superphosphate of ammonia	91.33	91.3
Sulphate of ammonia	76.49	99.5
Without nitrogen	70.50	78.5

The action of superphosphate of ammonia was thus the same in the kinds of soil, while that of sulphate of ammonia was lower in the reous soil than in the sandy one. The writer comes to the conclu- that when conditions are very favourable to the volatilization of nia losses up to 20 per cent. occur, and that these losses can be ed or considerably reduced by using superphosphate of ammonia.

The Utilization of Peat in Italy. — Summary of a Lecture by Prof. UGO ROSSI en at a meeting of the Association of Italian Agriculturists, April 20, 1914. — *Società gli Agricoltori Italiani, Bollettino quindicinale*, Year XIX, No. 10, pp. 356-361. me, May 31, 1914.

Several of the more important peat beds in Italy have been worked y with a view of utilizing the peat as fuel. Most of the peat is how- too poor to compete with imported coal, hence the lack of success such undertakings even where they were connected with land nation schemes. Attempts have also been made to use peat for purposes, such as litter, packing and isolating material, etc., ne quantities thus used are too insignificant to be of any economic tance. Of late, however, the nitrogen contained in peat has attracted derable attention ; this nitrogen is practically in an inert condition in aw material and in order to utilize peat successfully as a manure, trogen must be transformed into a more active compound such as a f ammonia.

The idea of subjecting peat to the water-gas process was suggested by . MOND and the first plant erected for the purpose was that at Oren- n the province of Lucca, Italy ; it has since been much improved by dition of plant for preparing and drying the peat. The next important of the kind were those at Osnabruck (Hanover) under the direc- f Drs. FRANK and CARO, but owing to the difficulties connected with eparation and drying of the peat, these works may be considered as still in the experimental stage, as are other works started in England. ast works to be erected were those at Codigoro, Italy, where all dif- es have been successfully overcome. In fact the only two important akings for the utilization of peat are those of Orentano and Codigoro ing to the " Società per l'utilizzazione dei combustibili italiani ". he process adopted for treating peat is the following: The peat, pro- dried and broken up, is thrown into a turret-shaped oven 26 to 33 gh, called the gas oven, which is fed at intervals from the top. The urns only in the lower part of the turret, the combustion being ted by a jet of hot air and steam. The water vapour decomposes incandescent mass, producing, together with the other combustion the so-called water gas, or in this case Mond gas, which collects top of the oven. It is produced at the lowest possible tem- re and the nitrogen evolved from the peat combines with the t hydrogen and forms ammonia. The gas thus produced is then l to free it from the tarry products it contains and led into n chamber where it is met by a spray of sulphuric acid which con- the ammonia into sulphate, while the remaining gas is purified,

cooled and burned under the steam boilers, in the drying ovens or in motors. In this way about three-quarters of the quantity of nitrogen contained in the peat is converted into sulphate of ammonia. A peat containing 2.5 per cent. of nitrogen yields about 175 lbs. of sulphate of ammonia to the ton.

The first factory was erected at Orentano in 1907, but only began work in 1910. At first the peat was dried in the open, but as this system proved quite unsatisfactory artificial drying was resorted to. Peat taken from the pit contains 50 per cent. by weight of water, and this quantity is now most successfully reduced to 25 per cent.

At present 1800 cu. ft of peat can be treated daily, yielding 30 tons of sulphate of ammonia per month, and before long the output will be doubled. The gas is used in the works and at a central station developing about 800 H P.

The results obtained at Orentano encouraged the company to erect large works at Codigoro (Ferrara, Italy) in 1912; these are now capable of dealing with 150 tons of dried peat daily and of turning out from 10 to 12 tons of sulphate of ammonia per day. The peat beds at Codigoro are afterwards of 2500 acres in extent. The Company has already spent £240,000 on the two factories, but it can now produce sulphate of ammonia at 4*s* 10*d* to 5*s* 7*d* per cwt. while the market price is above 12*s* per cwt.

715 – **Talbot Slag**. — DAFERT, O. in *Zeitschrift für das Landwirtschaftliche Versuchswesen in Oesterreich*, Year XVII, Part 5, pp. 301-302. Vienna, May 1914.

The "Talbot slag" obtained in the manufacture of steel by Talbot process differs very little in outward appearance from ordinary basic slag.

According to the results of four analyses its composition may be taken as follows:

	Talbot slag		Basic slag. Average according to F. W. Dafert	
	Range per cent.	Average per cent.	I (*) per cent.	II (**) per cent.
Mg O	3.75 – 4.60	4.25	2.97	–
Ca O	45.70 – 50.42	48.10	47.33	45
Mn O	3.50 – 6.46	4.91	4.51	6
Al_2O_3	3.58 – 7.48	5.28	1.87	–
Fe O	5.45 – 9.23	7.34	10.85	–
F_2O_3	2.75 – 7.35	5.25	5.38	–
$Si O_2$	8.86 – 10.04	9.48	8.34	8
P_2O_5	14.01 – 17.90	15.99	17.38	18
S	0.22 – 0.88	0.51	0.42	–
$S O_3$	traces – 0.16	0.08	0.28	–

(*) According to an older analysis. — (**) According to recent analysis.

ıe citric-acid-soluble phosphoric acid ranges from 74.2 to 90.1 average of 81.3 per cent. of the total phosphoric acid ; it is thus the usual limits of basic slag, from which it does not appear to differ as a fertilizer. Manurial experiments now being carried out at the ı Experiment Station for Agricultural Chemistry will soon settle ıint.

he Effect of one Crop upon Another. — THE DUKE OF BEDFORD and TERING, S. U. in *Journal of Agriculture Science*, Vol. VI, Part 2, pp. 136-151, ı plate. Cambridge, May 1914.

ıe writers review the results of the investigations on the effect of g grass over the roots of fruit and other trees carried out at Woburn 895, and give an account of recent work on the effect of grasses ıver on various crops and on each other. In addition to field experi- trees were grown in pots fitted with annular trays. Both metal rthenware trays were used. The ratio of the weight of soil in the that in the tray was 31.9 and the relative surface of the grass-grown the tray to the surface of the pots was 1:2. All the water required) the pots up to a given weight was put into the trays. The dry of the matured crops was used to determined the effect of the dif- ;onditions.

ıt of 23 instances only four showed a favourable effect and in 12 es the effect of grass in the trays was to reduce the crop in the pots to :age of about one-half. The reduction varies with the crop, tobacco ıore sensitive than tomatoes and mustard, and these more sensitive arley. In the case of tobacco the amount of the reduction was ional to the growth of grass, and, in a former experiment where the f 18 different grasses on apple trees was examined, the magnitude :ffect was found to vary with the vigour of the grasses.

ıce the smaller crops (*i.e.* those in the pots below the grass-grown :emove less nitrogen from the soil, the soil in these pots should be ı nitrogen than those without grass. Analysis of the soils showed be the case. Therefore the reduction in the growth of the crops ;rass must be due to some toxic substance which reduces the power :rop to utilise the available plant food.

moval of the trays containing grass before maturity resulted in a ıcrease in the growth of the crop, so that the plants not only made lost lee-way, but actually outstriped those without grass. This effect loubtedly due to the destruction of the toxic substance by oxidation e formation of beneficial products. Leachings from growing grass, sed, were found to be beneficial instead of toxic, and it has been ıat soil removed from grassed ground is more favourable to the growth than that from similar tilled ground. Further, it is possible that grassing might have a beneficial effect, when the grass is at such nce from the tree roots that the toxin becomes oxidised before g these roots. This was found to be the case at Woburn : apple ith grass at a distance of 3 ft. from the stems grew more rapidly me than trees with grass 6 ft. away or with grass up to the stems.

Recovery from the toxic effect may not always occur, for this effect may produce permanent injury, especially in the case of hard-wooded plants.

The toxic effect between the same plants is greater than that between different plants. Also, the toxic effect of heating a soil is much greater than that produced by the growth of a crop in both cases the toxin, after oxidation, increases the fertility of the soil. There is therefore no reason for assuming that the toxin is an excretion from the plant, the debris from the growing roots being probably sufficient to account for its formation.

717 – **The Action of Certain Nutrient and Non-nutrient Bases on Plant Growth** (1).
— McCool, M. M. in *Cornell University Agricultural Experiment Station, Memoir* No. 2, pp. 121-216, figs. 1-15. Ithaca, N. Y., August 1913.

I. *The antitoxic action of certain nutrient and non-nutrient bases with respect to plants.*

An extensive series of experiments has been made on the toxic and antidotal action of various ions on plant growth, particularly with respect to the elongation of the roots of seedlings. The chief conclusions of these experiments are as follows:

1) Each of the following radicles (in the order given) is poisonous to seedlings: Ba, Sr, NH_3, Mg, Na, K.

2) Mutual antagonism exists between the following pairs of cations when present together in solution:

Mg and Sr	Na and K
K and Sr	Na and NH_3
Na and Sr	K and Ba
Mg and Ba.	

3) Calcium is the most effective of any of the substances studied in preventing toxic action.

4) Protective action is not confined to the so-called essential nutrients; Na, Sr and Ba (the non-essential ions) also possess this property.

The injurious action resulting when unbalanced conditions prevail, and the importance of calcium in correcting this action, make it probable that in many cases the beneficial effects obtained from calcium compounds are due to antagonistic relations. In any event the general trend of results indicates that where any single fertiliser has proved injurious it would be useful to apply a calcium compound, at least in limited quantity. Various theories have been advanced regarding the causes of antagonistic action between different ions, and the writer has made experiments which show that the permeability of the cell is altered, details of which will be published later.

II. *The toxicity of manganese and the antidotal relations between it and other cations with respect to green plants* (2).

Pure solutions of manganese salts are extremely poisonous to [illegible] and wheat seedlings. The degree of toxicity is greatly reduced in [illegible]

(1) See also No. 13, *B.* Jan. 1914.
(2) See also No. 613, *B* July 1914. (*Ed.*)

nutrient solutions and in soil cultures. The injurious action appears chiefly in the upper portions of the plant, chlorosis being the first indication of an overdose. Protection from light diminishes the injurious effects. Calcium, potassium, sodium and magnesium ions are each effective in counteracting the poisonous action of manganese.

III. *The toxicity of various cations.*

Comparative studies of the poisonous action of the chlorides of calcium, potassium, sodium, magnesium, ammonium, barium, strontium and manganese in distilled water, in full nutrient solution and in soil cultures have been made. The concentrations in which no further elongation of seedlings takes place, those in which slight growth occurs and those that result in no injury to seedlings have been determined. Field pea seedlings were employed as indicators and in some cases wheat seedlings were also used. It was found that :

1) Calcium ions are the least toxic and require concentrations only a little lower than those causing plasmolysis to inhibit growth.

2) No appreciable root growth appears in solutions stronger than

$\frac{N}{50}$ KCl, $\frac{N}{75}$ NaCl, $\frac{N}{500}$ $MgCl_2$, $\frac{N}{1000}$ NH_4Cl, $\frac{N}{4000}$ $BaCl_2$ and $\frac{N}{5}$ $SrCl_2$.

3) In full nutrient and soil cultures, the lethal concentrations of the various bases with the exception of strontium and barium, are practically identical, namely $\frac{N}{3}$ to $\frac{N}{5}$.

4) Under experimental conditions, much stronger solutions are required to prevent top growth than to kill the roots of seedlings.

5) Seedlings that have grown for 10 days in either distilled water, tap water, or full nutrient solutions, are far more resistant to any toxicant studied than are those that are placed immediately in the toxic solutions.

6) The chlorides of ammonium, magnesium, potassium, and calcium, in the order given, are injurious to germination in pure solutions and in soil cultures. These results suggest that fertilisers should be judiciously applied to soils.

An extensive bibliography and a review of previous work on this subject is also given.

8 - **Edible and Poisonous Fungi from the Nancy District.** — BERTRAND and SARTORY, A. in *Bulletin des séances de la Société des Sciences de Nancy*, Series III, Vol. XIV, No. 2, pp. 82-214, Nancy, April-July 1913.

An account of the edible, poisonous, and innocuous fungi, together with a key for identifying the Agaricineae, Polyporeae, Hydneae, Clavarieae, Lycoperdeae, Morchelleae, Helvelleae and Pezizeae. Vernacular and scientific names are given ; the distribution of the species according to the various soils is discussed ; toxicity, poisons and antidotes are also discussed.

719 – **Inheritance of the Capacity for Production.** (1) — ROEMER, TH. in *Fühling's Landwirtschaftliche Zeitung*, Year 63, Part 8. pp. 257-268. Stuttgart, April 15, 1914.

Opinions are still divided as to the importance of Mendelian laws fo breeding practice. The chief reason for this is the prominence given i agricultural breeding work to "performance", that is to the combined actio of a more or less complex series of characters of a biological nature, whic are much more difficult to observe and test than morphological ones. A the same time, the inheritance of such biological characters has bee tested in a considerable number of cases, including: fertility in *Stizole bium*, self-sterility in *Cardamine pratensis* and *Reseda*, pollen sterility i potatoes, size of grain in maize, flintiness and flouriness in wheat and maiz chemical composition of the seed in maize, hardiness in wheat, resistance t cold in *Mirabilis*, flowering-time in peas, production and quality of leav in tobacco, standing power in wheat, rust-resistance in wheat, time of r pening in wheat, oats, barley and maize, discontinuity in the ear in barle annual and biennial condition in *Hyoscyamus*, power of growth in duck fertility in hens, temperament in dogs, defects of vision (non-traumatic) horses.

These investigations have shown that there is no essential differenc in mode of inheritance between morphological and biological character In the splitting up in the second generation, however, biological characte show a preponderance of the ratio 1 : 2 : 1 over the ratio 3 : 1. The biological characters appear to be the expression of a number of units this makes the investigation of the Mendelian inheritance of the capaci for production very difficult, as numerous slight variations which cann be successfully grouped arise in the second generation.

From the above, the importance of Mendelism in breeding for produ tivity is already evident. As a complete analysis of the hybrids accordin to their capacity for production appears not to be possible, agricultur breeding work cannot make use of Mendelian laws to the same extent some branches of horticultural work, in which the results of certain cross can be predicted. At the same time we have to thank the new studies heredity for the knowledge that in the crossing of two races all the possib combinations of the unit characters borne by each will turn up; further, th an abundant second generation will already show just what can be reache as the result of any particular cross, and that the progeny of an individu is the only sure test of its hereditary disposition and therefore of its bree ing value, outward appearance being quite unreliable. These points ho for all types of breeding, while in breeding for productivity the knowled that we can obtain forms surpassing the more productive of the two parent and at the same time combining the valuable characters of both parent in a new and favourable manner, is highly important; in practice it allow an improvement in productivity to be obtained by crossing forms of equ productive power, that is to say without having to resort to parents whic

(1) See also No. 1547, *B.* Nov. 1912; Nos. 490 and 495, *B.* May 1913; No. 95 Aug. 1913; and No. 1045, *B.* Sept. 1913. (*Ed.*).

, combine extremes of the desired character with insufficient develop-
it of other characters of production. As this departure from the aver-
invariably appears in the second generation and can be determined in
offspring of these individuals, that is in the third generation families,
breeder may already reach a definite result by this third generation,
iout any fear of valuable material being unwittingly discarded.

- International Factors connected with the Physiology of Germination in Wheat Grains. — NILSSON-EHLE, H. (Svalöf, Sweden) in *Zeitschrift für Pflanzenzüchtung*, Vol. II, Part 2, pp. 153-187 + 1 plate. Berlin, April 1914.

The following results have been reached after many years' study of the
nination and anatomy of wheat.

1. The rapidity or slowness of germination immediately after rip-
ıg is a hereditary character distinctive for different varieties, and in
offspring of crosses shows decided segregation on the usual lines.

2. This physiological character is shown, both by comparison of
erent varieties and strains and by segregation after crossing, to be
the main independent of hardiness (Winterfestigkeit) and early ripen-
, which characters depend on other internal factors. It is possible to
bine high or low resistance to germination with high or low hardiness
early-ripening properties.

3. These differences in germination characters between different
eties of wheat are connected with a series of internal hereditary factors.

4. Among these factors, that of « redness », which produces the red
ur of the grain, is of special importance in hindering germination imme-
ely after ripening. The white wheats, which generally lack red factors,
minate most readily; next come those with a single red factor, while
e with several red factors germinate most slowly.

5. The germination characteristics of the different varieties are only
ially dependent on the red factor; other internal factors act as co-
rminants. In particular readiness to germinate and the specific course
his condition in individual varieties are probably independent of the
factors and dependent on other internal factors; at the same time the
factors act in preventing germination in the same direction as insuffi-
ripeness.

6. The observed facts throw fresh light on the important part play-
y the pericarp in the physiology of germination; the principal action
doubt exerted by the corky layer, to which Schröder attributes regu-
n of the permeability and in which the red factor is localised.

7. The white and one-factor red wheats examined show somewhat
e rapid absorption of water than those with more than one red factor.

8. The action of the red factors in hindering germination is at any
partly exerted through their influence on the structure of the pericarp.
he absence of red factors the inner integument is thinner and more
ate than otherwise.

9. The pericarp consists of two quite separate integuments, insoluble
ncentrated sulphuric acid; in red varieties each consists of two layers

of cells, while in white varieties the inner one is quite structureless in t ripe grain.

The writer considers this demonstration of a physiological charact istic composed of a number of internal factors as of considerable theoretic importance; the proof of this has been facilitated by the circumstan that the simultaneous morphological action of the factors is readily obser able.

These observations are also in support of the theory that adaptati takes place by accumulation or some other type of combination of vario hereditary factors.

It certainly seems that cultivated plants are more adapted for t study of general biological questions than wild ones, owing to the gr variety of forms protected under cultivation; wild species, on the oth hand, may often contain only adapted forms in which all the factors i a particular character are present together, preventing the possibility any genetic analysis.

721 – **Xenia in *Phaseolus* Crosses.** — DANIEL, JEAN, in *Revue horticole*, Year No. 11, pp. 253-257. Paris, June 1, 1914.

The Spanish bean (*Phaseolus multiflorus*) was crossed with the bla Belgian bean (*P. vulgaris nanus*) and the resulting progeny were inves gated more especially with regard to xenia (*i. e.* the reaction of the hybr embryo on the surrounding tissues in the seed) exhibited by the seed co

The Spanish bean is large and spotted black and violet, while the B gian bean is small and has a shiny black surface. Pedigree seed was us in the experiments. The pods obtained as a result of the cross in 19 contained seeds in size and shape like those of the Spanish bean, but colour shiny black like those of the male. The same cross in 1912 ga three kinds of pods: some which contained shiny black seeds, some whi contained seeds of a chocolate brown colour and others whose seeds w light dun, showing that xenia may vary in intensity according to c cumstances.

In all cases, sections showed that the pigment in the cells of t testa was the only character affected.

Two of the 1910 progeny mentioned above were sown in 1911. T resulting plants were exactly like the female parent (*i. e.* Spanish bean w red flowers); they were selfed, producing spotted seeds which were sown in 19 In this next generation all cotyledons were hypogeous as in the mater parent, which they also resembled in having the climbing habit. T flowers however were of three types: some plants had red flowers l the maternal parent; others had red standards whith wings and k white or white with red spots; others again had flowers of a dirty wh colour. The all-red flowers yielded nothing but purple spotted seeds various shades; the red-and-white flowers yielded brown spotted seeds a the white flowers yielded white seeds more or less reticulated (1).

(1) See No. 115, *B*. Feb. 1914.

A plant belonging to each type was again selfed, and the resulting eds again showed segregation, but without the recurrence of violet)wers or black testa.

2 - **The Inheritance of Germination Energy, Germination Capacity and Sensitiveness to Light in Seeds of *Poa pratensis*.** — PIEPER, H. in *Fühlings Landwirtschaftliche Zeitung*, Year 63, No. 10, pp. 362-368. Stuttgart, May 15, 1914.

As the result of a series of tests with seeds of *Poa pratensis*, the variaons of germination energy, of germination capacity and of sensitiveness light appeared to be hereditary characters in the different strains. The ssibility of using this fact in breeding work will depend on the correlation the above characters with other desirable ones, the existence of which d not become apparent in the trials. Neither was it possible to decide om the trials whether the differences observed in the germination capacity ere due to the structure of the seed or to that of the fruit.

3 - **Researches on the Germination Capacity and on the Capacity of the Plumule to Emerge from the Soil.** — GISEVIUS and CLAUS in *Fühlings Landwirtschaftliche Zeitung*, Year 63, Part 9, pp. 297-318. Stuttgart, May 1, 1914.

The writers compare the germination capacity with the capacity of he plumule to emerge from the earth or from the layer of sand covering he seeds. They experimented upon 9 samples of winter rye, 42 of winter heat and 24 of spring barley. The determination of the germination apacity was carried out at different times, according to the regulations of he Union of Agricultural Experiment Stations, in a germination box proided with ventilation and a thermostat, and always with four samples. The etermination of the capacity of emerging was made in Hiltner boxes; hese were partially filled with quartz sand the grains of which did not xceed 1 mm. in diameter; the seeds were pressed into this and covered ith a layer 3 or 5 cm. deep of coarse sand (1 to 2.5 mm. diameter) hich would not form a crust over the sprouting seeds. In this case also ur tests were made for each sample. These boxes were placed in a room ept at the most uniform temperature possible of about 18° C.

The result of the investigation into the capacity of emergence of the lumule in rye, which was tested 100 and 160 days after harvest, was the llowing: if the determination of the energy and capacity of emergence of he plumule are to be determined by the same method as the energy and apacity of germination, the figures obtained on the 7th and 12th day using covering of 3 cm. of sand are considered suitable. It is not yet known whether his would be the case also in spring (these experiments were made in lovember and January). The 5 cm. covering of sand did not offer any dvantage over the 3 cm. covering.

Wheat was tested 33 and 153 days after harvest, barley 70 and 160 days fter, but for oats the tests were not complete; for all three the same conitions as for rye may be taken.

It appears that the capacity of germination is generally greater than the apacity of emerging. As it was not possible to carry out both determinaions immediately after reaping, a complete judgment on the significance

Report on seed examined in April 1914.

Kind of seed	Country of origin	Weed seeds		Other seeds		Percentage of non-germinable seeds	Percentage of diseased seeds	Quantity examined	Remarks
		Species	Per-centage	Species	Per-centage				
Dutch clover (*Trifolium repens*) . . .	England	*Crepis capillaris*	0.02	*Trifolium pratense*	0.01	1.24	*nil*	½ oz.	A little grit present.
		Prunella vulgaris	0.10	*Plantago lanceolata*	0.57				
		Amaranthus retroflexus	0.04	*Phleum pratense*	0.02				
		Rumex Acetosella	19.26	*Holcus lanatus*	0.02				
				Cichorium Intybus	0.02				
Dutch clover (*Trifolium repens*) . . .	New Zealand	*Rumex Acetosella*	3.05	*Plantago lanceolata*	0.42	3.25	*nil*	½ oz.	
		Prunella vulgaris	0.01	*Phleum pratense*	0.04				
				Medicago lupulina	0.04				
				Cichorium Intybus	0.14				
Niger seed (*Guizotia abyssinica*)	India	*Cuscuta* sp.	0.77	*Sesamum indicum*	8.65	*nil*	*nil*	1 oz.	A large percentage of sand present.
		Raphanus Raphanistrum	1.04						
		Amaranthus retroflexus	0.95						
Niger seed (*Guizotia abyssinica*)	India	*Cuscuta* sp.	0.38	*Sesamum indicum*	1.56	*nil*	*nil*	1 oz.	A large percentage of sand present.
		Raphanus Raphanistrum	0.37						
		Amaranthus retroflexus	0.34						

the capacity of emerging is not yet possible. These experiments have, wever, shown that there is a practical method for determining the ca- city of emergence and that the greater amount of time required by the t is not so considerable as to prevent its being used instead of that for rmination capacity; the emergence test is in itself more precise d, as these still incomplete experiments seem to point out, allows the ccurrence of factors influencing the sprouting of seed, such as the effect saline solutions or of an attack of *Fusarium*, to be distinctly recognised.

– **Impurities in Seeds in Victoria, Australia.** — *Communicated by* S. S. CAMERON *Director of Agriculture.*

(See table on opposite page).

– **Researches on the Ears of Wheat and of Spelt for the Precise Character- isation of Varieties.** — KONDO, M. in *Landwirtschaftliche Jahrbücher*, Vol. XLV, Part 5, pp. 713-817 + 3 figs. Berlin, 1913.

These investigations extended to 62 winter wheats and 20 spring ats (of which 80 were *Triticum vulgare* Vill.) and 16 spelts (*T. Spelta* L.). y were all of them of the 1911 crops and either bred at Hohenheim or second crop from the original seed. Of each variety about thirty ; were selected and from these five typical ones were again picked out ge, medium and small); of each the awns, colour of the glumes, the sence of hairs, density of spikelets, weight and size of the ear, and colour eed, were observed. Further investigations were made for each variety groups of three ears (heavy, medium and light) as to the distribution veight of the grains and spikelets in the ear and as to the constitution the grains.

The results are the following: In common wheats the ears possessing dium density always show the highest weight of ear, the highest grain ght of ear and the greatest weight per thousand grains. In the dense- ed wheats the decline in the grain weight towards the tip is greater n in the medium or loose-eared ones. In the upper end of the ears the ins are much smaller than in the lower end. In medium and loose s the weight of the grains is relatively the same. The best form of ear ommon wheat is not the dense club form, but the medium parallel- d form.

In spring wheat in general, the weight of the ears, of the total grain of the thousand grains, as well as the number of ears and grains, are h lower than in winter wheats. The weight of the ears and of the grain pelt are almost the same as in spring wheat. The number of grains in t is much inferior to that in winter and spring wheat. On the other d the thousand-grain weight is higher. The belt of the heaviest grains e ear varies according to the several varieties; in some it is in the cen- third of the ear, in others on the border between the central and lower d, or in the middle and lower third and often in the upper third. In dense ears the belt is mostly on the limit between the lower and middle d. In the medium dense and loose ears it is in the middle third. In er wheats the belt of the heaviest grains is scarcely ever in the upper

third, while in spring wheat it is most frequently in the middle or in t upper half of the ear. In spelt it is mostly in the middle of the ear and ver rarely in the upper third.

In general it can be stated that in winter and spring wheat and in spe the number of grains in a spikelet and the average grain weight are a their highest in the middle third of the ear. The ratio between the bottom and the top third is not constant, and varies according to the variety an species. In winter wheat in general, the lowest third is superior to the high est in every respect; in spring wheat the number of grains in the upper third and the individual grain weight in the lower third are at their lowest In spelt the number of grains is smallest in the lower third and the individu grain weight is least in the upper third.

The distribution of grains in the ears is characteristic of the seve varieties. In general the length of the rachis, the number of grains, total grain weight and the thousand-grain weight vary with weight the ear, but inversely with the density of the spikelet and the numb of sterile spikelets in the lower part of the ear. The ratio between weig of ear and the number of spikelets and the density of the grain is not co stant. It is therefore not advantageous to endeavour to breed wheat greater density of spikelets, but it is very important to improve the low part of the ear.

As for the colour of the grain, which depends upon various condition white and red may be assumed to be the fundamental colours which fix the characters of the different varieties. The colour depends chiefly up the pigment in the pericarp and only secondarily upon the mealiness flintiness. In each ear the colour of the grain is quite uniform.

The form of the full grain and the presence or absence of the depressi in the longitudinal furrow on the flat side of the grain are to be consider as characters of the variety. The hairs at the tip of winter and spri wheat grains are thick-walled, with narrow lumen, and straight; they va in length according to the variety. The hairs of spelt possess relatively thin walls, and large lumina; they are often twisted and are longer than common wheat. The length of these hairs is a character of the variety.

The writer considers size and weight of the wheat grains as to a certa degree characters of variety and species; mealiness and flintiness are al characters of variety in spite of the fact that they are not invariable.

An important character for the determination of variety and spec is the middle layer of the four which make up the pericarp in the species *Triticum*.

726 – **Six Years' Trials of Winter Wheats in Denmark (1907-1912).** – Report of the Danish Crop Experiment Organisation (1). — *Communicated by Committee on Plant Breeding.*

These trials were carried out at the Experiment Stations at S (Lolland) and Tystofte (West Zealand); the experiment ground is in e case on a good loam.

(1) A full report is given in *Tidsskrift for Landbrugets Planteavl*, price 6 kr. (8 the vol. of 800 pp.

At Tystofte two series of trials were made each year, one after bare ow and the other after a fallow cropped with turnips; at Abed the wheat ; always sown on bare fallow land. In each trial there were 6 to 8 ad- ent plots of $^1/_{200}$ tondeland (33 sq. yds.) in area ; on every third plot tofte Standwell was grown n for comparison. Altogether 23 varieties e grown, 8 of them in all the trials; the yields of the others were calculated omparison with the average of these eight.

The winters were on the whole favourable ; in one of the six trials at ed some damage was done, but at Tystofte none. For this reason less hardy varieties gave relatively high yields.

Heaviest croppers. — A yield of 43 to 44 ctn. per tondeland (58 to bushels per acre) was given by : 1) Queen Wilhelmina II, 2) Tystofte all II, and 3) Tystofte Standwell II. All three are improvements on the ginals of the same name obtained at Tystofte ; they none of them differ m their originals except in giving 8 to 10 bushels more grain.

Queen Wilhelmina II gives a very heavy yield under favourable condi- ns ; it is not very tall and tillers relatively little, but stands very straight ; s, however, not very hardy, about equalling the ordinary Squarehead.

Tystofte Small II can be relied upon to give a heavy yield ; it tillers her more than the preceding, but is somewhat liable to lodge.

Tystofte Standwell II has a rather shorter and stiffer straw than the tall; it is very hardy and tillers well, but for this reason may grow too ck and become liable to lodging or to imperfect development of the grain ; stands late sowing better than the other two. At Tystofte it gave a ver yield than the Small after bare follow, but beat the latter after a pped fallow.

Second group. — The following gave a yield of 39 to 41 ctn. per tonde- d (52 ½ to 55 bushels per acre) : 4) Abed Large-eared, 5) Svalöf Extra uarehead II, 6) Svalöf Grenadier II, 7) Carter's Standup, 8) Webb's w Standup, and 9) Svälof Sun.

Abed Large-eared tillers fairly well, is only moderately hardy, but nds very straight ; with favourable weather it gives a plentiful crop of in ; the bushel-weight is below the average.

Of the Svalöf varieties, Extra Squarehead II is very hardy, Grenadier II y moderately so ; these give some 2 to 4 bushels more than the older ieties of the same names. The Sun wheat is very hardy ; at Abed it better than the other two, but at Tystofte less well.

Webb's and Carter's Standup wheats are very much alike ; they tiller le, are not very hardy and have short and stiff straw ; under favour- e conditions they are heavy croppers and at the same time stand well.

Light croppers. — Yields of 33-37 ctn. per tondeland (44 ½ to ½ bu. per acre) were given by : 10) Tystofte Bearded, 11) Strube's arded No. 56, 12) Scotch Squarehead from Lidsö, 13) Strube's Square- d, 14) Erh. Frederiksen's Squarehead, 15) Bencard's Red, 16) Svalöf er, and 17) Abed Lancet.

Minnesota No. 529 gives only 24 ctn. (31.3 bu. per acre) of grain.

727 – **Field Trials with Spring Wheat** (1) **and Oats in Germany in 1909-10.** – 1. ZADE, A. Haferanbauversuche auf leichteren Böden 1909-10. — *Arbeiten der Deutschen Landwirts-Gesellschaft*, No. 252, 99 pp. — 2. ROSE, H. Sommerweizenanbauversuche 1909-10. — *Ibid.*, 59 pp. Berlin, 1913.

I. *Trials of oats on light soils.*

The number of experiments was 50 in 1909 and 56 in 1910; they were distributed over the whole of Germany. The three varieties taken in the main trials were: Leutewitz Yellow, F. von Lochow's Yellow and Svalöf Golden Rain.

The reports are drawn up like those of the other variety trials made by the German Agricultural Society. The positions of the three varieties as regards the various qualities are shown in the following table:

	Yield of grain		Yield of straw		Resistance to lodging		Bushel weight		Percentage of chaff
	1909	1910	1909	1910	1909	1910	1909	1910	1909
F. von Lochow's Yellow	I	I	III	III	II (2)	III	II	II	I
Svalöf Golden Rain	II	III	I	I	I	I	I	I	II
Leutewitz Yellow	III	II	II	II	II (2)	II	III	III	III

(1) I = lowest. — (2) Equal 2nd.

It is seen that the results for the two years are fairly concordant.

II. *Trials of spring wheats.*

The trials of wheats were made at 37 places in 1909 and 38 in 1910. The varieties taken for comparison were Rimpau's Red Schlanstedt for early sowing, good soils and favourable weather conditions, and Strube's Bearded for later sowing, light soils and unfavourable weather conditions; the other trial varieties were Heine's Japhet and Wohltmann's Blue Dame.

The average yields of grain of the four varieties are shown in the accompanying table (in lbs. per acre).

	Comparison of all four varieties		Comparison of three varieties	
	1909 (13 trials)	1910 (10 trials)	1909 (12 trials)	1910 (9 trials)
Rimpau's Red Schlanstedt	2 865	2 040	2 700	23
Strube's Bearded	2 579	2 158	—	—
Heine's Japhet	2 869	2 032	2 740	24
Wohltmann's Blue Dame	2 654	1 828	2 643	22

(1) For loose-eared varieties of winter wheat, see No. 227, *B.* March 1914 (Abstract of *Arbeiten der D. L. G.*, No. 248). (*Ed.*)

Rimpau's Red and Heine's Japhet are seen to be very nearly equal, lc Blue Dame comes decidedly behind them. Strube's Bearded was the : in 1910 under certain circumstances, such as soils hardly to be classed vheat land, unfavourable places, or East German continental conditions ı low rainfall. For straw yield Rimpau's Red and Strube's Bearded ıe off best ; Blue Dame was lowest in this respect, but at the same time most resistant to lodging. Strube's Bearded showed the shortest od of growth in each yeai ; it also gave the flintiest grain.
Results of preliminary trials of other varieties are also given.

- **The Early Fruwirth Goldthorpe Barley.** — WACKER, H, in *Zeitschrift für Pflanzenzüchtun*', Vol. II, Part 2, pp. 233-248. Berlin, April 1914.

The writer describes the origin of the Early Fruwirth Goldthorpe ley, which is a pure line in Johannsen's sense ; it is descended from a ıt observed by Fruwirth in 1899 in a field of Goldthorpe barley on the erimental ground of Hohenheim Agricultural College. The variety, ch the hairs on the rachilla shew to belong to *Hordeum distichum erec-*, is described as follows: It exhibits a close-set ear of medium length, h fairly wide spreading awns. The grain is of medium length and stout, a yellowish-white colour, with rather narrower glumes than ordinary ldthorpe barley, and has a high starch content. The stem is of medium gth, rather thin, but wiry and strong, and therefore does not easily ge. The yielding capacity is excellent, and ripening takes place 8 or 10 ys earlier than with ordinary Goldthorpe barley. Smut occurs very ely, as the spikelet remains closed after flowering. This fact also pre-les any chance of cross-fertilization. Nevertheless, in 1908 some plants ıeared among the descendants of plants selectedin 1899-1902 for early turity and grain yield and simply allowed to multiply from 1902 to 1907, ich produced descendants differing from others in the colour of the grain l in the strength of the stem. According to the writer, spontaneous iations within the pure line must therefore have occurred.
Cultivation is now being carried on with a view to further improving ı variety, which has been included in the Register of the German Agricul-al Society.

- **Formation of Aerial Tubers in Potatoes.** — FORTIK, TH. in *Monatshefte für Landwirtschaft*, Year III, Part 5-6, pp. 111-120 + 3 figs. Vienna and Leipzig, 1914.

The writer has observed the occurrence of aerial tubers in the potato ieties Topas (since 1910) and Marius, and occasionally in a selection from f. Wohltmann. These tubers occur on the main stem and branches, gly or in clusters, and may be as big as pigeon's eggs ; they are grass-en with purple spots. They often bear nodosities, from which, or from tubers themselves, rosettes of soft leaves may arise. The formation aerial tubers takes place especially on haulms which have got bent n to the ground, but in this case the tubers may be of normal size. The ter believes the occurrence to be favoured by heavy manuring combined h cool damp weather.

On planting some of the 1910 aerial tubers of Topas, yields were ... tained in 1912 and 1913 heavier than the average of the variety.

730 – ***Dalembertia populifolia*: an Edible Plant in Mexico.** — Bois, D., and Diguet, L., in *L'Agriculture pratique des pays chauds*, Year XIV, No. 134, pp. 257-29... Paris, May 1914.

Dalembertia populifolia Baillon, known as " Jicama de baryta " o " Jicama del cerro ", is a shrub; at certain times of the year its roots pro duce tuberous swellings which are edible and are sold in large quantitie in Central Mexico. The plant only exists in the wild state and to collect th tubers, which are usually close under the surface of the ground, a hole i first dug close to the stem, and the roots are followed horizontally, care bein taken not to injure the base of the stems, as the plant is perennial. Th writers cultivated the plant experimentally and found that it could be pro pagated by seeds and cuttings, but that the tubers could not be used fo this purpose. Though containing little nutritive matter, *Dalembertia* i popular as an article of diet, either cooked or raw, and is eaten either alon or with other foods; it is of special value for quenching thirst on a lon march in the burning sun.

731 – **Observations on the Laying-down and Care of Permanent Pastures.** Elofson, A., in *Svaenska Mosskultur-Föreningens Tidskrift*, Year 27, No. 2, pp. 7... Jönköping, March 1914. (From the writers summary).

The writer begins by calling to mind the great importance of cattl breeding in relation to the national food supply, as well as to agricultur especially in districts unsuited to arable farming. With the aid of comm societies, a gross return had been reached in cattle breeding such as cou scarcely have been dreamt of before, but those stock-farms which we carried on on highly intensive lines were now merely marking time, or ev declining, both as regards their milk-production, and also in return per h food units. The zenith, as regards the capacity of the animals, had ther fore been reached, and the net returns now no longer corresponded to t high gross figures.

The writer sees the reason for this in the fact that too much stress h been placed on the results of chemico-biological research in scienti cattle feeding, without reference to the great demands of biology, omission which is bound to bring retribution, since the attainments of t animals must always in the long run depend on their constitutions. T fruits of intensive, unnatural stall-feeding are decreased power of resistan lessened reproductive power, etc.: hence great expense in rearing fre stock, and less complete utilization of raw foodstuffs.

The main food should consist of hay and roots in winter and past in summer. Special attention should be paid to the improvement of he production, so that a heavy, and also cheap, crop may be forthcomi When hay can be produced, as it is on several farms in Sweden, at 25 32*s* per ton, it forms a cheap feed, even when used in large quantities.

Pasturage is the cheapest food, in relation to production, that there is, modern Swedish pasture farming also demonstrates. Since pasture farm- on a large scale considerably diminishes the farmer's labour-bill, and vides him with the greatest possible quantity of foodstuff per unit of a (1), the writer recommends Swedish farmers to make use of the vantages of modern pasture farming. The first step in this direction he improvement of great areas of natural pasture. It is to be noted that y such areas as are not very well suited for growing cereals should be used this purpose, or at least only so much of the better land as circumstances y demand : for example, if young stock is to be raised and there is no er land available, or where pasture for dairy cattle is required close to the nestead. Pasture farming on a large scale should not be allowed to erfere with the output of cereals.

The preliminary conditions necessary to make permanent pastures pay present in Sweden. For land is cheap and the distribution of the rain- is favorable ; most rain falls in late summer, when the pastures are st sensitive to drought. Our light nights, and the fact that the energy growth increases as the northern frontier is approached, make the pro- tion decidedly large in proportion to the length of the growing period.

In laying down permanent pastures, especial attention must be paid manuring. For sowing in a bleak climate, the seed must be of varieties ch stand the winter well. These are not usually in stock on the seed kets, but they grow wild everywhere in northern countries, and in- le, for example, meadow fescue, red fescue, smooth-stalked meadow- ss, rough-stalked meadow-grass, foxtail, etc. A firm seed-bed and a y seeding are essential conditions for the success of the pasture.

The dressing of manure should be :

8 to 16 cwt. lime 2 ½ to 3 ¼ cwt. superphosphate or 5 to 7 cwt. basic slag 5 to 6 ½ cwt. kainit	every three years.

Heavy and dry soils should get as much manure supplying humus as ible ; nitrogen should be given according to requirements : the quan- used in these parts is about ½ cwt. of nitrate of soda and sulphate nmonia an acre a year.

The results so far obtained in Sweden are satisfactory. At Vallinge, ödermanland, Hr. Kleen obtained 1200 food-units (2) an acre at a cost roduction of £3 5s, including all expenses. This works out at two ls of a penny per food-unit. If foodstuffs have to be purchased, the of production rises to at least twice as much.

1) Experiments in Denmark shew that grass mown 6 times (c. g. Cocksfoot) gives ter crop of hay, but a larger amount of digestible foodstuff, than when mown only . ("Om Vaeksten af Hundegräs och Draphavre", etc., by E. LINHARD, in *Tidskrift andbrugets Planteavl*).

2) A food-unit is equal to about 1.33 lb. of starch value.

The daily increase in live-weight of young stock amounts to 600 to 700 gms. (20 to 25 oz.) per head. At Latorp, where the mean rainfall is 13.7 in. for the six months April to September the increase per head per day exceeded 900 gms. (2 lbs.).

On the experimental farm of the Swedish Moor Cultivation Society at Flahult, near Jönköping, excellent results have also been obtained from peat soils, with a net profit of over £2 4s per acre.

In Central Sweden the pasturage period lasts about 150 days, that is about the same as in Germany.

732 – ***Beckmannia erucaeformis* Host., a New Grass for Moor Meadows.** WITTMACK, L. (Berlin) in *Mitteilungen der Deutschen Landwirtschafts-Gesellsch.* Year XXIX, Nos. 22 and 24, pp. 309-312 and 356, + 3 plates. Berlin, May 30 and June 13, 1914.

The writers gives a description of *Beckmannia erucaeformis* Host this grass has also been referred to *Phalaris* (Linnaeus) and *Cynosu* (Aiton and Willdenow), but is now made the only representative of t genus *Beckmannia.*

This species is found in Italy, Hungary, S. E. and E. Europe, N. and C. Asia, and in America from Alaska to Minnesota ; several varieties have been described. It occurs along rivers and in swamps, in Russia also i saline marshes. In Germany it has been introduced here and there.

There is little information as to its feeding value. In Russia, where it has already been grown on a large scale in some places, it is considered useful, though giving a rather coarse hay. It appears to resist frosts and fungi, and grows very tall. The abundance of salts characteristic of most of its stations in Russia does not seem to be essential. The productive of seed is abundant, in spite of its perennial character ; the trade "seed" consists of the whole spikelets.

733 – **A Fodder for the Dry Season: *Tripsacum fasciculatum* Trinius.** PEDROSO, A. in *Journal d'Agriculture Tropicale*, Year 14, No. 155, pp. 137-138. Par May 31, 1914.

Trials have been carried out in Costa Rica with *Tripsacum fasciculatum* Trinius, a perennial grass somewhat similar to sugarcane in appearance It may reach a height of more than 16 ft., produces adventitious roots an continues to vegetate almost indefinitely. Cattle eat it readily, horses rathe less willingly and then only the leaves or the young stems cut up. Th special advantage of *Tripsacum* is that it remains green during the dr season and yields good crops even on poor soil.

Propagation takes place by means of slips which are set about 3 ½ i deep and 20 in. apart. For the first six months after planting the land mu be kept hoed and free from weeds. Four cuts per annum are obtaine the last of which should take place at least one month before the end of th rainy season in order that the plant should be sufficiently recovered stand the subsequent drought.

- African ***Bombax.*** — VUILLET, J. in *L'Agronomie coloniale*, Year I, No. 10, pp. 97-105. Paris, April 30, 1914.

The existence of numerous natural hybrids makes it frequently very ficult to identify the various species and varieties of *Bombax ;* moreover mplete specimens of the trees are not easy to obtain, as they only flower er the leaves have fallen, and the new shoots do not appear till after the its have dropped. The writer distinguishes four *Bombax* in the Nigerian udan :

1. *B. with ribbed fruits.* — The ovary has five well marked furrows its upper half, which alternate with the lines corresponding to the valvu- sutures in the fruit and form a five-toothed crown at the top ; the capsule s five deep inter-sutural furrows clearly defined in the upper half ; the ds are sub-spherical instead of pyriform.

2. *B. with papillose fruits* — Calyx not very villous and only half length of the flower instead of two-thirds ; capsules slightly papillose.

3. *B. with long fruits* — Calyx always longer than half its diameter showing a very irregular edge when burst by the opening flower; ovary ger than in other species (6 to 7 mm. in diameter at the base by 10 mm. g) and not concave at the top ; fruits sub-cylindrical and drawn out in shape of a sausage.

4. *B. with yellow flowers.* — Leaves usually made up of five leaflets, cker and forming a more obtuse angle at the base than other Soudan spe- ; flowers yellow or yellowish-green on the outer surface of the petals, hter yellow on the inside; fruits slightly furrowed at the base and having ll ridges in the upper half.

- **The Oil Palm *(Elaeis guineensis).*** — BECCARI, ODOARDO in *L'Agricultura coloniale*, Year VIII, Nos. 1-4, pp. 5, 108, 201, 255. Florence, January-April 1914.

The writer discusses the work of ADAM and of CHEVALIER on *Elaeis* and ws up the following classification of the oil palms to serve as a basis lecting and breeding new varieties for cultivation. He also describes w variety, *E. guineensis macrocarya* Becc., with remarkably large fruits, nut of which varies in weight from 23 gm. to 54 gm. (1 to 2 oz.) and may sure up to 50 × 43 mm. ; the shell of the nut is very thick and the kernel nall and irregular in shape ; the albumen has a rather large central ca- and the albumen tissue is made up of larger cells than that of any r variety and contains a larger number of crystalloids.

Classification of Elaeis.

Species	Varieties	Previously called
E. guineensis Jacq.	*angulosa* Becc.	"Ökpörö Eyop", Bull. Misc. Inf. Kew, 190[illegible] No. 2.
	albescens Becc.	"Abefita", Bull. Misc. Inf. Kew, 1909, No. [illegible]
	communis Aug. Chev.	—
	form *androgina* Aug. Chev.	—
	» *divisa* Aug. Chev.	—
	» *ramosa* Aug. Chev.	—
	sub. var. *dura* Becc.	*E. nigrescens* (typ. Aug. Chev. Documents, p. [illegible]
	» *fatua* Becc.	"Abe-dam" Bull. Misc. Inf. Kew, 1909, No. [illegible]
	» *leucocarpa* Becc.	*E. nigrescens* communis (*vulgaris*) Aug. Chev. Doc. p. 50.
	semidura Becc.	"Abe-tuntun", Bull. Misc. Inf. Kew, 190[illegible] No. 2.
	» *tenera* Becc.	*E. nigrescens* communis Aug. Chev., Doc. p. 49.
	gracilinux Aug. Chev.	—
	idolatrica Aug. Chev.	—
	intermedia Aug. Chev.	—
	macrocarpa Aug. Chev.	—
	macrophylla Aug. Chev.	—
	pisifera Aug. Chev.	—
	repanda Aug. Chev.	—
	rostrata Becc.	"Mbana Eop", Bull. Misc. Inf. Kew, 1909, No. [illegible]
	macrocarya Becc.	—
E. madagascariensis Becc.		*E. guineensis* var. *madagascariensis* Jum. et Perrier de la Bâth.
E. melanococca Gaertn.		—

736 – **Manuring Experiments with Hevea.** — DE JONG, W. K. in *Teysmannia* Year XXIII, No. 3, pp 133-144. Batavia, 1914.

An account of manurial experiments carried out on 80 trees aged to 7 ½ years.

17 - **Tapping Trials with *Funtumia elastica* in the Belgian Congo.** — GISSELAIRE, A. in *Bulletin Agricole du Congo belge*, Vol. V, No. 1, pp. 95-104. Brussels, March 1914.

Tapping experiments were carried out in the Bangala district on trees 7 to 9 years old. The tapping was done in the early morning, being finished at half-past eight or nine at the latest; herring-bone incisions were employed, single or double according to the size of the trunk, all trees of over 20 in. circumference at 3 ft. from the soil receiving the double incision; lateral incisions were 10 in. from the central incisions and large trees were tapped to a height of 16 ft. Coagulation was brought about by boiling water.

The following results were obtained at Musa: 1696 trees yielded 75 gallons of latex from which 375 lbs. of raw rubber were coagulated, or 3.6 oz. per tree including scrap. As the trees can probably be tapped twice a year this quantity should be doubled to estimate the annual produc-

At Katu, 1368 *Funtumia* yielded 67 gallons of latex from which 345 of raw rubber were obtained, or 4.3 oz. per tree including scrap. The rubber lost 23 per cent. on drying so that 3.3 oz. of dry rubber were obtained per tree or 6.6 oz. per tree per annum, and one acre planted 10 ft. apart would yield 200 lbs. of dry rubber per annum.

Samples from both localities were submitted to experts, who reported favourably on their quality and estimated their value as equal to that of plantation hevea.

- **The Nipa Palm (1) as a Commercial Source of Sugar.** — PRATT, D. S., THURLOW, L. W., WILLIAMS, R. R., and GIBBS, H. D., in *The Philippine Journal of Science*, Vol. VIII, Section A, No. 6, pp. 377-398. Manila, December 1913.

The nipa palm (*Nipa fruticans* Wurmb.) covers large tracts of land in the Philippines which amount to 18 000 hectares (45 000 acres) in the provinces of Bulacan and Pampanga alone. Up to the present the sap exuded by the flower stalk has only been utilized on a large scale as a commercial source of alcohol; it was examined by the writers with regard to the possibility of extracting the sugar contained.

The yield amounts to about 40 litres (9 ½ gallons) of sap per season of 90 days per annum, or, with 750 trees per hectare, to 30 000 litres per hectare (2650 galls. per acre) per annum, the maximum flow occurring during the second month. As it flows from the palm the sap contains about 15 per cent. of saccharose and has an apparent purity of not less than 85, only traces of invert sugar being present; the addition of about 0.5 per cent. of sodium chloride slightly reduces the purity without lowering the extraction of sugar as it is classed among the non-melassigenic salts; waxes, acids, pectins and other foreign materials are practically absent; the sap contains active enzymes of the invertase and peroxidase types, the latter being present only during the final period of secretion and being capable of oxidizing sucrose and invert sugar in either neutral or alkaline solution.

(1) See No. 2884, *B.* Aug.-Sep.-Oct. 1911 and No. 604, *B.* May 1913. (*Ed.*).

The sap is usually collected in bamboo tubes known as "tuquils" containing a little milk of lime and sulphite, which destroy the enzyme and avoid the necessity of subsequent bleaching; the use of small funnels to convey the juice to the bottom of the tuquils avoids stratification and results in more perfect conservation with but small additional expense. The total cost of collecting the sap and delivering it to the mill amounts to $1.50 per 1000 litres (2s 9d per 100 galls.).

A thousand litres of sap yield on an average 115 kg. of commercial white sugar polarising at from 99° to 99.5°. No important modification of methods now used in sugar practise is necessary in dealing with nipa juice; furthermore, no expense corresponding to the grinding of cane or extraction of beets need be incurred, while the fuel supplied by the bagasse may be easily substituted by the cheap and plentiful wood of mangrove swamps.

As about 9 000 litres of sap are required to produce 1 ton of 96° sugar, 90 000 litres daily would be required to run a 10 ton mill at full capacity that is the produce of 450 hectares. A mill designed to manufacture sugar from nipa juice would be available for refining Philippine sugar during the portion of the year when no sap is flowing, a process in which there is a reasonable profit. All estimates are conservative and there is every indication of the establishment of a successful industry.

The Bureau of Science (Manila) will gladly furnish samples of nipa sugar to any one interested.

739 – **Analysis of Sugar-Beets.** — PELLET, H. in *Sucrerie Indigène et Coloniale*, Vol. LXXXIII, Nos. 19 and 20, pp. 441-446 and 466-471. Paris, May 13 and 20, 1914.

As the result of a long series of analyses, the writer concludes that there is no relation between the size of sugar-beets and their sugar content.

740 – **The Cultivation of Cacao in Trinidad and the Gold Coast.** — FREEMAN, W. G. *Bulletin of the Department of Agriculture, Trinidad and Tobago*, Vol. XIII, No. 1, pp. 75-83. Trinidad, March-April 1914.

A reply to an article in the *Philippine Agricultural Review* attributing the recent decline in the exports of Cacao from Trinidad to bad cultural practices, overshading of trees and severe fungus disease.

The writer points out that this decline corresponds to seasons of abnormally low rainfall and gives figures showing a considerable improvement in the production of cacao during 1913 corresponding to an improvement in the climatic conditions. Reference is also made to reports of the Gold Coast Department of Agriculture showing that the remarkable increase in the exports of cacao from West Africa is due to the natural advantages of suitable areas and cheap labour, rather than to the application of scientific horticultural methods.

741 – **Manurial Experiments with Tobacco.** — VRIES, O. in *Proefstation voor Vorstenlandsche Tabak. Mededeelen* No. IX, pp. 42. Amsterdam.

Manurial trials with tobacco were carried out on poor soils in Java during the years 1912 and 1913, with the object of determining the effect of the fertilizers on the quality of the tobacco.

The following results were obtained: on the "brown" soils potash little effect on the quality of tobacco, while superphosphate injured combustibility without spoiling the colour of the ash; on the blue clay sandy soils potash was again without action, while superphosphate ietimes proved beneficial and sometimes harmful both to the combusti-:y and to the colour of the ash. Sulphate of ammonia had no harmful :ts and occasionally affected the quality beneficially; its use is there- advocated, as it always increases the yield.

- **Experiments in Harvesting Tobacco Leaves.** — DE VRIES, O. in *Proefstation voor Vorstenlandsche Tabak, Mededeelin* No. VIII. pp. 43. Amsterdam.

Experiments on methods of harvesting tobacco leaves were carried during 1912 and 1913 in Java. It is recommended that all picking uld be done in the early part of the day and that leaves from the lower :s of the plants should be picked singly, except in wet years, when it ld probably be better to pick the whole plant at once, for in that case over-maturity of the lower leaves would be an advantage during the ng process.

- **The Market-Gardening Districts of Northern Germany.** — WEIRUP, in *Arbeiten der Deutschen Landwirtschafts-Gesellschaft*, No. 250, pp. 1-40. Berlin, 1913.

The above publication is a report of the horticultural conditions in Luneburg district, in the Hamburg district and in West Holstein ented to the "Deutsche Landwirtschafts-Gesellschaft". These dis-:s are partly under fruit trees and partly under early potatoes, straw-ies, rhubard and vegetables. The chief markets are Hamburg and na, but at the present time these outlets are not sufficient to deal with he cabbages produced, and the marketing conditions generally should mproved. The large market at Hamburg with its store rooms is spe-y described, also the premises of the "Fruchthandel-Gesellschaft" of nen, which organises the supplies of fresh market-garden produce not from the local districts but also from more distant ones.

- **Fruit Growing in Australia.** — HATTRICK, J. M. in *Deutsche Obstbauzeitung*, No. 11, pp. 231-244. Stuttgart, June 1, 1914.

The rural population of Australia is small as compared with the urban ulation — the total population only amounting to five millions — and of

TABLE I. — *Distribution of surface (acres).*

	Total area	Total area cultivated	Under cereals	Vineyards	Fruit plantations
rn Australia	624 588 800	855 023	648 801	2 795	16 737
Australia	243 244 800	4 141 992	2 228 482	22 952	22 411
ia	56 245 760	5 386 247	2 877 315	23 412	57 375
nia	16 777 600	5 380 971	142 666	—	24 919
South Wales	198 054 400	3 381 920	2 436 050	8 036	47 354
sland	431 120 000	935 021	295 801	1 633	17 466
Zealand	67 040 600	16 265 889	692 565	781	31 952

TABLE II. — *Area under the different kinds of fruit, in acres.*

Kind of fruit	Western Australia	South Australia	Victoria	Tasmania	New South Wales	Queensland	
Hard fruit:							
Apples	9 956	10 183	22 164	22 678	11 165	1 238	773
Pears	1 211	996	6 338	—	2 590	54	11
Quinces	—	—	810	—	531	8	1
Stone fruit:							
Apricots	521	1 735	2 441	—	880	47	3
Cherries	—	838	2 755	—	1 532	30	5
Peaches	1 352	1 710	4 095	—	7 006	615	14
Plums	823	1 349	4 903	—	1 411	210	8
Nectarines	—	—	59	—	—	45	
Persimmons	—	—	5	—	141	15	
Nuts:							
Coconuts	—	—	—	—	—	237	
Hazel nuts	—	—	400	—	—	—	
Almonds	—	2 778	260	—	—	2	3
Walnuts	—	—	800	—	—	—	
Citrus fruits:							
Oranges	1 026	2 014	860	—	14 468	3 450	21
Lemons	220	553	680	—	3 680	47	
Tangerines	—	—	—	—	4 643	—	
Other fruits (*tropical, etc.*)							
Pineapples	—	—	—	—	—	2 417	
Figs	600	—	440	—	—	15	
Bananas	326	—	—	—	—	6 462	
Custard-apples	—	—	—	—	—	50	
Loquats	—	—	64	—	—	—	
Papaws	—	—	—	—	—	185	
Passion fruit	—	—	50	—	57	12	
Breadfruit	—	—	—	—	—	360	
Small fruit	714	272	6 240	—	126	808	
Unclassified	—	—	—	4 238	—	—	
Total	16 748	22 428	53 364	26 916	48 230	16 313	

TABLE III. — *Average yields of fruit per tree, lbs.*

Kind of fruit	Queensland	N. S. W.	Victoria	S. Australia	W. Australia	Tasmania
le	22	45	46	30	26	29
nge	81	49	66	44	27	—
ch	—	46	52	26	27	—
r	—	57	88	56	43	—
m	—	65	51	45	—	—
ricot	34 to 38 throughout Australia					
rry	21 to 28 » »					
pon	—	53	—	—	—	—
ngerine	—	51	—	—	—	—
ond	—	—	—	2½	—	—
ana	178 bunches p. acre					
apple	318 doz. fruits »					

rural population only a small part grow fruit. Yet the area under is already considerable in spite of the industry being still in its infancy. le I gives the distribution of the area in 1911 in Australia and New land.

In every State except South Australia the area under vineyards is ller than that under fruit trees; the latter has increased at the rate bout 4500 acres per annum for the last ten years in Australia and New land.

Kinds of fruit. — The climate being well adapted to fruit growing, ecially in the coastal regions (S. Queensland), most kinds flourish; distribution of the various kinds is given in Table II.

There are no available data for New Zealand and it is pointed out as different methods of collecting the returns are employed in the ious States, the figures are only approximate.

The most important Australian fruit is the apple, followed at a distance orange, peach, pear, plum, and small fruit. Queensland produces tropical fruits (oranges, bananas and pineapples), New South Wales s citrus fruit more especially, but peaches, apples and pears also flourish e; in Victoria, the so-called "Orchard State", the fruits of temperate ates (apples, pears, etc.) predominate, though citrus fruits do well in northern part; Tasmania is above all the apple orchard of Australia; th Australia grows more especially apples and almonds; and lastly tern Australia grows apples.

Average yields. — Average yields for each kind of fruit are obtained dividing the official returns of production for each State by the number rees in that State. The resulting figures are sometimes very low; rtain parts, especially in Western Australia, the area under fruit trees

has been more than doubled during the last seven years, with the result that many of the orchards are very young and yielding small crops; besides this, many orchards are planted in unsuitable places by inexpert townspeople and the poor returns from such orchards reduce the average yield for the State. In Table III are set out the average yields of various fruits in each State.

The average yield for apples varies from 22 lbs. to 46 lbs., being lowest in Queensland and highest in Victoria and New South Wales; the yield in Tasmania is depressed by the fact that the trees are planted too close together in some of the old orchards; Western Australia only averages 2 lbs. in spite of her eminently suitable climate.

Varieties grown. — Owing to the variable climatic conditions met with in the various States, the varieties grown are very numerous.

Apples (classed in order of importance).

Maiden's Blush, Duke of Clarence, Pomme de Neige (early, exported to Great Britain)
* Bismarck
King of the Pippins
Cox's Orange Pippin
Scarlet Nonpareil (late)
* Cleopatra (mid-season).
Jonathan.
Sturmer's Pippin.
French Crab (late).
Dumelow.
London Pippin or
Three-crowned Pippin.
Lane's Prince Albert (mid-season).
Statesman.
Lord Suffolk (early).
* Stetwarts (late).
Gravensteiner (mid-season).
Rome Beauty (late).
Esopus Spitzenberg (late).
Peasgood Nonsuch (early).
Wealthy (mid-season).
Shepherds' Perfection (mid-season).
Stone Pippin (late).
Rymer (late).
Schroeder (late).
Winter Strawberry (late).
* Rokewood (very late, keeps well in cool storage).
Shorland Queen (early).
Canada Pippin (mid-season).
Yates.
Kaiser Alexander.
Newmann's Seedling (late).
Green Alfriston (early).
* Granny Smith.
* Carrington (early).
* Trivett (early, resistant to blight and heavy cropper).
Mc Intosh Red (early).
Twenty Ounce Pippin.
Warner's King (early).
Beauty of Bath (early).
Lady Daly.
* Dunn's Favourite or Munroe's Favourite

Pears.

Clapp's Favourite.
William's Bonchrétien.
Beurré Superfin.
Box's Bottling Pear.
Beurré Diel.
Winter Beurré d'Hardepont.
Doyenne du Comice.
* Winter Cole.
Beurré Curé.
Josephine de Maline.

* Of Australian origin.

,er Nelis.	Madame Cole (late).
ge.	Keiffer (mid-season).
khams' Triumph.	Broom Park (late).
ė d'Anjou.	Anna Nelis.
erence.	Autumn Beurré Coloma.
ell.	

Quinces.

e Shaped.	Pear Shaped.
Mammoth.	Master's Early.
eal.	

Apricots.

	Shipley's Blenheim.
rk.	Peach.
	Large Orange.
ld's Seedling.	Alsace.
rke.	

Cherries (on wild Mazzard stock).

ford- Hart (best of the earlies).	Early Lyons.
on.	Florence.
Republican.	Noble.
ont.	St. Margaret.

Peaches.

ion.	Nicholls Orange Cling.
gold.	Philip Cling.
l Dewey.	Pullar's Cling.
	Brigges Red May.
a.	Early Albert.
ide Elberta.	Early Louise.
ia.	Elberta.
	Hains Early.
	Mountain Rose.

Plums.

Burdett.	Purple Gage.
Purple.	Washington.
September.	Clyman.
	Denniston's Superb.
	Diamond.
	Diaprée Rouge.
lden Drop.	Early Orleans.
eedling.	Evans Early.
fort.	Green Gage.
Englebert.	Jodoigne Green Gage.

October Green Gage.
Oullins Golden Gage.
Princess Alexandre.
The Czar.
Denbigh.
Deneyer's Victoria.
Grand Duke.

Brandes Jordan.
Nonpareil.

Dwarf Profilic.

Emperor.
Thorny.
Beauty of Glen Retreat.

Washington Navel.
Joppa.
Parramatta.
White Siletta.

Lisbon.
Lisbon Thornless.
Sweet Rind.

Cavendish.
Lady's Finger.
Plantain.

Adam.
Blue Provence.
Angelique Bordeaux.
Black Turkey.

Cherry.
La Fertile.
La Versaillaise.
Red Dutch.
Mammoth.
Imperiale de Milan.
Jefferson.
Late Black Orleans.
Magum Bonum (white and red).
Monarch.
Pond's Seedling.

Almonds.

Paper Shell.
Sultana.

Walnuts.

Santa Barbara.

Tangerines.

Parker's Special.
Canton.
Scarlet.

Oranges.

Late Valencia.
Thompson's Selected.
Paterson's Seedling.

Lemons.

Villa Franca.
Genoa.

Bananas.

Sapientum.
Giant Sugar.

Figs.

Brown Turkey.
Black Genoa.
Brown Ischia.
Blue Ischia.

Red and White Currants.

Red Imperial.
White Dutch.
White Transparent.
White Imperial.

Black Currants.

Naples.
's Black.
ion.

Kentish Hero.
Lee's Prolific.
Ogden's Black Grape.

Gooseberries.

Red:

)ean.
Bob.
iboy.
Regent.
ering Hero.
diner.
Seedling.
l.
g Lion.
hire Hero.
Provider.

White:

Gill's Seedling.
Northern Hero.
White Muslin.
Thumper.
Waterloo.
Plunder.
Smiling Beauty.
Whitesmith.
White Lion.
White Eagle.

Green:

l Graham.
Green.
Gascoigne.
wood.
Overall.
of Oak
ke.
rewe.
k.

Yellow:

Dublin.
Goldfinder.
High Sheriff.
Leader.
Leveller.
Pretty Boy.
Rockwood.
Sulphur.
Trumpeter.
Yellow Lion.

Raspberries.

p Red.
p White.
ff.
mberland Fillbasket.

Victoria.
Cuthbert.
Franconia.
Golden Queen.

Strawberries.

a.
l Queen.
h.
t Seedling.
re.
's Noble.
nal.
y Rawson.
ion.

Glenfield Beauty.
Governor General.
Howcroft.
King Edward VII.
Marguerite.
Marshall.
Zena.
Lord Kitchener.
Trollope's Victoria.
Creswell.

Planting Fruit Trees. — Land may always be obtained from Government on very favourable terms for the purpose of planting fi provided that the holder builds a house and lives on the land. Usu payment is made in twenty small annual instalments. Such land als consists of unbroken bush or forest, so that the formation of an orcl is a laborious matter ; felled timber is unsaleable and has to be burne the spot. Young trees are provided by the large Australian nurser they usually consist of pure varieties and are planted on the square o quincunx method at the rate of 90 to 100 trees per acre. Trees come bearing very early owing to the warm climate : apples, for instance, fair crops at five or six years old.

Cultivations. — The hot climate and the summer droughts, oc ring just at fruiting time and lasting three, four, or even six months, n sitate repeated cultivations, which on the other hand are limited by scarcity of labour. Immediately after the fruit has been gathered soil is ploughed deeply in order to absorb as much water as possible di the winter. A second ploughing is usually given at the end of July or b ning of August to destroy weeds, and during the summer the surface is stirred to prevent evaporation.

Manuring. — Most of the land under fruit is sufficiently fertile to require manuring, but fruit has also been planted on some poorer where it soon became evident that the trees were being starved and c quently manuring had to be resorted to. Farmyard manure is r available, as the farmers only possess the bare number of horses req to work the holding and these are not often in the stable. In the neigh hood of towns where it may be bought cheaply , dung is frequently em ed ; in other parts it is replaced by green manuring to make good th of humus, which decomposes rapidly owing to the hot climate. (crops are only grown during the winter, as their drying effect wou bad during the summer ; they consist almost entirely of leguminous c which do well in the cool winter months. Peas and vetches are c employed ; the orchard is cultivated in autumn (February-March) as as the fruit crop has been harvested, and seed is sown in April ; in Augu green crop flowers and is ploughed in. A few growers use forest leaf r instead of a green crop where shallow cultivations are employed in not to injure the roots of the fruit trees. Artificial manures are a common use, especially bone flour or other phosphatic manures, be the soils while very rich in potash are exceptionally poor in phos acid ; a more complete manuring is becoming usual.

Irrigation. — Good returns are obtained by irrigating fruit orc in Australia, and a fair proportion of the land under fruit is irriga spite of the undeveloped state of the country :

New South Wales	1 000 acres
Victoria	17 550 »
South Australia	3 600 »
Total	22 150 »

Victoria is justly called the Australian Irrigation State, though New
:h Wales completed in July 1913 a colossal dam which is to hold up
ıst as much water as the Assuan dam in Egypt, and to help to bring
ɔo acres under irrigation by means of a canal 240 miles long. At the
ent moment the Mildura district, Victoria (6 500 inhabitants), is the
important irrigation area. It is situated on the Murray and extends
9 700 acres, having been founded in 1887 by the Chaffey Bros., who
ved large grants of land in Victoria and undertook to construct
rrigation system. At present the land is occupied by small holders;
ıoldings vary in size from 10 to 40 acres and the right to water goes
the land. Four pumps with a total capacity of 22 million gallons per
ıte raise the water 50 to 90 ft. above the level of the river; the irri-
ɔn works are administered by a committee elected from amongst the
ers, which levies the water rate and regulates the distribution of the
er; rates vary from 10s to £2 per acre. The pumps usually work
about 120 days per annum, providing one watering in winter, two
ıwing close on one another in the summer, and one in the autumn.
chief crops at Mildura are raisins, lemons and peaches.

Another important irrigation scheme, in this case belonging to the
e of Victoria, is situated in the valley of the Goulburn, where reservoirs
e already been constructed to hold 60 000 million gallons; others are
ıned to raise the total storage capacity to 360 000 million gallons, which
be sufficient to irrigate 750 000 acres. Small irrigation plants in the
caster district should also be noted; almost every holder has a tank
he top of his orchard into which water is pumped by means of a wind-
or a petrol engine and from which the water is led in channels to all
s of the holding. The chief irrigation scheme in South Australia is
Renmarck, also on the Murray and on the same principle as Mildura,
of about one-third the size of the latter.

Management of trees. — Usually half-standards are planted; four to
or even nine main branches are trained in a cup shape, the centre of
tree being kept as open as possible; all secondary branches are kept short
hat the fruit is formed close to the main branches which is said to faci-
te the feeding of the fruit. Pruning varies with the different varieties,
the writer is inclined to think that it is always somewhat excessive,
ept in the case of lemon trees, where only the dead wood is cut out.

Enemies and their control. — Codling moth (*Carpocapsa pomonella*)
ses serious damage to apples; lead arsenate washes are used against it
well as grease bands. American blight (*Schizoneura lanigera*) is also
y prevalent; it is checked by means of paraffin emulsion washes. A
ease known as "bitter pit" causes serious harm and is being investigated
he present time. Other parasites frequently met with are: red spider
tranychus telarius), San Jose scale (*Aspidiotus perniciosus*), peach leaf
rl (*Exoascus deformans*), *Clasterosporium carpophilum*. Certain pre-
tive measures are prescribed by law.

Fruit Trade. — All small fruit, as well as a large part of the citrus fruit,
ls a market in the Australian towns. Apples, lemons and dried fruits

find an Australian market at certain times of the year but are also impo ant export products, more especially in the case of apples; the develo ment and extent of the apple trade is given in Table IV.

TABLE IV. — *Exports of apples in tons.*

State	1910	1911	1912
Western Australia.	198	281	1 163
South Australia	2 335	1 258	3 369
Victoria	2 935	5 303	5 447
Tasmania	10 320	12 824	14 669
New South Wales.	250	136	306
Total . . .	16 038	19 801	24 954

Apples are mostly sent to Great Britain, but also to Germany (abou 180 000 barrels in 1912), the Far East, South Africa and South Amer In the modern orchards only those varieties are grown which are suita for export. The production is continually increasing so that it is constan sought to improve the existing markets and to find new ones, a mat which should not prove difficult as the apples are of excellent quality a arrive in Europe from March to May, at a season when the home crop already consumed; they consequently fetch good prices.

While the organisation of the export trade is excellent, that of the hom trade is poor, especially with regard to marketing, so that the produce are sometimes completely in the hands of the town retail dealers and frequently occurs that producers receive very little for their crops when t consumers are paying a high price.

Cost of planting and production. — Conditions are so variable that th data can only be given approximately. The cost of buying the lan clearing, cultivating, fencing, planting and management up to the time th trees are in full bearing is estimated at from £75 to £100 per acre. . twelve-year-old apple orchard should bring in £20 per acre per annum

745 – **South American Fruit.** — *Boletin de la Union Panamericana*, Vol. XXXVII No. 3, pp. 318-335. Washington, March 1914.

The writer describes the general conditions of fruit growing in South America and the possible developments of the industry in view of the variations of climate met with in the different parts of the continent and of the new transport facilities afforded by the opening of the Panama Canal. He points out the difference between fruit growing in North America, where deciduous trees prevail, and in South America, where the tropical and sub-tropical fruits are more general and native apples, pears, peaches and plums do not exist. Native fruits of South America are as follows:

Guava (*Psidium Guaiava*).
Custard apple (*Anona Cherimolia*).
Passion fruit (*Passiflora edulis*).
Spondias dulcis.
Prickly pear (*Opuntia* sp.)
Gomorlega nitida Queule.
Murta murtella (*Myrtus Ugni* Molina), with berries very like the blueberry (*Vaccinium*).
Maqui (*Aristotelia Macqui*), sometimes mixed with grapes in the manufacture of wine.
Grapes, an unimportant variety found in the extreme north.
Capuill or Capoilles (*Prunus salicifolia*), rather like the American wild cherry.
A few other kinds which are little known.

Very few of these fruits are given in the American Pomology and many of little commercial importance, but there is every reason to believe the usual commercial kinds can also be produced as many have al- y been successfully introduced: for example sapotas, mangoes, bread s, tamarinds, pomegranates, avocados (*Persea gratissima*), olives, figs, is fruits, are grown in sub-tropical regions, while the ordinary fruits e United States are grown in the temperate regions.

In the Argentine the vine is the only fruit cultivated on a large scale, ast plains of the region being little adapted to fruit growing; neverthe- in the pampas, and especially in the neighbourhood of Buenos Ayres, attention is now being paid to the matter. The so-called Tigre Islands e mouth of the Paraña are famous for their peaches. Around Tucuman s fruits, especially oranges, are cultivated and the industry might be developed with improved means of transport and better methods cking. Regions in the province of Salta are well adapted to sub- cal fruits, such as the custard apple and avocado, which are as yet only ced for local consumption. In the provinces of Neuquen and Rio some wild apples occur, which, according to tradition, are descended trees imported by the Jesuits and which still yield fruit of good quality. he vine is the only fruit possessing any real commercial importance gentine at the present day; of late years its cultivation has greatly sed and proved very remunerative in the province of Mendoza; a quipped school of viticulture has even been founded in Mendoza itself s to be extended next year. The prosperity of the industry dates the arrival in the district of some Italian vine growers. High quality grapes are produced and the erection of a small refrigerating plant s it seem likely that the Buenos Ayres market will soon be within Other fruits cultivated on a small scale in the Mendoza and San districts are peaches, nectarines, apricots and pears.

n Chili the general conditions are very similar to those prevailing lifornia and similar kinds and quality of fruit are produced, though dustry is much less developed in Chili; fruit of excellent quality and rance is found on the markets of Valparaiso, Santiago and Concepcion. en the Andes and Valparaiso, sub-tropical fruits such as avocado, d-apple and papaya are found, though they are inferior in size and

quality to similar fruits produced in their native tropical habitat; citrus fruits are cultivated in fairly large quantities in districts south of Santiago which are not subject to frosts, but are not abundant on the markets between January and April. As in the Argentine, grapes are the most important kind of fruit in Chili; they are mostly employed for the manufacture of wines which are very popular in South America and are exported to Argentina in large quantities; the wine-growing region extends from Santiago to Concepcion. In the south very good pears and apples are cultivated; in fact the apples of Valdivia are renowned throughout Chili and important orchards are found near Angel, south of Concepcion. Further south is a wooded region rather similar to parts of the States of Oregon and Washington; this southern region is frequently considered the most fertile in Chili, though very little has yet been done in the direction of bringing the land under cultivation except round Rio Bueno where a German colony has completely transformed the neighbourhood.

Peru and Bolivia are quite in the tropical zone, though the altitude in certain regions modifies their climate. Those tropical fruits which are capable of resisting the somewhat primitive methods of transport are found on the Peruvian markets and are of excellent quality; the grapes are good, but after transport are only fit for wine making; from April to June apples and peaches abound but these are not of first quality. Other fruits cultivated are oranges, bananas, avocados, custard-apples, sapotes (to a height of 6500 ft.), guavas, "ciruela agria", "gravadilla" (*Passiflora ligularis*), "tumbo" (*Passiflora quadrangularis*), prickly pear (*Opuntia Tuna*) which is very abundant, and a kind of wild cherry with fruit about the size of Richmond cherries which is picked from wild trees in the Urubamba Valley (north of Cuzco) and marketed in May. The fertile soil and excellent climate in parts of both Peru and Bolivia should make it possible to increase the production of fruit very considerably; it is at present much lower than it was several centuries ago before the Spanish occupation and the region only requires the restoration of the irrigation system in order to become once more productive. The period of ripening of the various fruits is as follows:

Apples. — March, or in rares cases January — February, to November.
Cherries. — November to February.
Peaches. — December to March.
Pears. — February to May.
Plums. — January to March.
Apricots. — December to February.
Grapes. — January to June.
Oranges. — September to December.
Lemons. — All the year round.

The fruits all mature at a time when the European and North American markets are without home supplies and would consequently fetch good prices; land is cheaper in South than in North America, irrigation water is abundant, labour is not costly, soils and climate are eminently suitable for fruit

owing; consequently it is likely that transport difficulties will soon be met d that the four countries discussed above are destined to become impor- nt producers of fruit.

; – **Influence of Different American Vine Stocks upon the Quantity and Quality of the Wines.** — FAES, H. and PORCHET, F. *Etude de l'influence de divers Porte-greffes sur la Qualité et la Quantité de la récolte.* Station viticole de Lausanne, 46 pp. Lausanne, 1914.

The Lausanne Vine-growing Station possesses in several parts of the nton of Vaud, nine experiment vineyards, each about two-thirds of acre in extent; they represent the most various conditions of soil and pect; except for two which serve other purposes, each is divided into three rtions. The first is planted with Chasselas Fendant grafted on various ocks; the second with direct-bearers (white and red) about which the sults obtained have not yet been published; the third (which is kept a check plot) is planted with European vines, especially Chasselas, on their n roots. The vines in these three portions are all of the same age, so at the influence of the stocks upon the wine can be freely studied in comrison with that produced by European vines upon their own roots. ch graft-bearing stock is represented by 80 or 100 specimens. The llowing have been tried: *Pure Americans* — Riparia Gloire de Montllier and Rupestris du Lot; *Americo-Americans* — Rip. × Rup. II F., nforer, 101-14, 3309 and 3306, Sol. × Rip. 1616, Berl. × Rip. 420 A., 7-11, 34 E., Rip. × Cord. - Rup. 106-8; *Franco-Americans* — Aramon × up. 1, Mourvèdre × Rup. 1202 and Chasselas × Berl. 41 B.

The yield of each stock of grafted vines is carefully recorded and the ust is examined chemically. The experiments were continued from 1911 1913. The most important results are summarized as follows:

Among the pure American vines, Rupestris du Lot in general appears erior to Riparia Gloire. The vines grafted on Rup. du Lot yielded igher crop, marked by a lower sugar content, while the amount of acidity s frequently rather high; the quality and quantity were more satisfacy when the grafted vine was trained as a cordon (in one vineyard all e vines were thus treated). Rip. Gloire does not thrive equally well on soils.

The group of Rip. × Rup. hybrids gave very uniform and good results d their yield was in general the highest of all stocks, the maximum being en by 3309; the next best was Rip. × Rup. 11 F., the third 101-14. this group a normal connection between quality and quantity was served, while Rup. du Lot, for instance, even with diminished quantity, ded grapes of inferior quality.

Sol. × Rip. 1616 behaved very well during all three years. In two the experimental vineyards it yielded the highest crops. The grapes general are sweet and have a low acid content.

The vines grafted on Rip. × Berl. give, as is well known, a limited duction during the first years; this was very clearly shown in 1911 in parison with the hybrids Rip. × Rup. Of the former, No. 157-11 was, ing the three years, the most productive; nevertheless the percentage of

sugar in the must was sufficient. In 1912 the difference in yield between the Berl. hybrids and those of Rip. × Rup. was already less marked and in 1913 the yield of the former approached still more that of the other stocks. Excepting in one experimental vineyard 34 E gave lower yields; it was also less rich in sugar than 157-11. The writers do not yet pronounce definitively on the Teleki Rip. × Berl. hybrids, which were only recently planted.

Rip. × Cord. - Rup. 106-8 gave a satisfactory yield; in 1911 it bore more than the Rip. × Berl. hybrids on the Franco-Americans.

In general the Franco-Americans during the three years, notwithstanding their vigorous development, yielded a crop lighter than and inferior in quality to that obtained by using as graft-bearers the less vigorous Rip. × Rup. hybrids. Aramon × Rupestris 1 and 1202 made no exception saving in two and one vineyards respectively, in which the compact and heavy soil seemed admirably suited to the Franco-Americans. But here also their yield did not come up to that of 3309. The sugar content in the grapes of these two common Franco-Americans did not show improvement in connection with the diminished quantity of yield. In comparing the two, it appears that 1202 often produced grapes with a higher acidity than Aramon × Rupestris 1. Stock 41 B behaved very differently in the various vineyards, as regards both quality and quantity; nevertheless in some it was fairly successful. Cabernet × Berlandieri (only recently planted in two vineyards) was not very productive and gave a must with too low a sugar content. The must of vines grafted on Vinifera × Rupestris 84-3, which were also only recently planted, showed in 1912 and 1913 a minimum of sugar and a maximum of acidity.

From the observations made it appears that in general (there are some exceptions) the content in sugar diminishes or increases inversely to the bulk of crop, while with acidity the reserve is the case.

747 – **Experiments in Growing Vine Hybrids in Styria.** — MATIASIC, FR. in *Zeitschrift für Weinbau und Weinbehandlung*, Year I, Part 5, pp. 209-218. Berlin, May 1914.

In Styria a great portion of the vineyards have been reconstituted (32 000 acres up to 1912) on American stocks; in many localities, especially in the south, these suffer from chlorosis, so that some of the plantations gradually perish.

In order to ascertain which are the most suitable stocks for these difficult conditions, the soil often containing large quantities of lime, the Government established a nursery at Dvor in 1903; here the hybrid stocks recommended for calcareous soil are tested. This nursery consists of a plantation of stocks for multiplication, a nursery proper in which the cuttings, some of them grafted and some not, are set to root, and another nursery of stocks under observation in which the hybrids are tested as grafted stocks.

The soil of the nursery for multiplication purposes is partly on marl and partly stony and it contains from 63 to 72 per cent. of lime. The nursery is about 2 acres in extent and has 3301 mother plants belonging

o 45 varieties of hybrids. The writer divides these hybrids into three roups.

The first includes those which have always been free from chlorosis : iparia-Cordifolia-Rupestris de Grasset 106-8, Berlandieri-Riparia 420 A, ramon Ganzin 1 (it has to be defended against mildew), Chasselas-Berlanieri 41 B (it also has to be protected against mildew), Riparia-Monticola R and Riparia-Rupestris. Their growth is very satisfactory (41 B somewhat weaker) and the same may be said of the maturing of their nes ; they are not susceptible to drought.

The second group contains the hybrids that are not immune from lorosis but which from other points of view are still fairly satisfactory : olonis-Riparia 1616, Mourvèdre-Rupestris 1202, Solonis-Rupestris, erlandieri-Riparia 420 B and C, 33 and 34 E. M., Riparia-Berlandieri eleki 4, 5, 6, 7, 8 and 9, Riparia-Berlandieri 157-11, Rupestris-Solonis 15-1 and 217-1, Riparia-Berlandieri 150-15, Pinot-Rupestris 1305, Rupesris-Berlandieri 301 A, Malbec Berlandieri 1a, Taylor-Narbonne, Gamayouderc and Aramon-Riparia 143 B. The canes of all of them mature sasfactorily. Solonis-Rupestris and 1616 on their own roots at Dvor are not ery resistant to phylloxera and consequently they are not to be consiered as graft bearers. No. 1202, Gamay-Couderc, 1305, 143 B and 1 A ffer from mildew.

The third group embraces those hybrids which do not resist chlorosis, o not grow satisfactorily, or are somewhat susceptible to drought, and hich consequently have been partly eliminated and replaced by better ybrids : Rupestris-Berlandieri 219 A, 220 A, 301 B and C, 301-37-152, abernet-Berlandieri 333, Cabernet-Rupestris 33 A (liable to mildew), upestris-Berlandieri Teleki 10 a, Riparia-Rupestris 3306-3309, 101 and 01-14, Colombeau-Riparia 2502 and Rupestris-Solonis Pecs. No. 101-14 as also eliminated as subject to phylloxera and suffering from frost. os. 219 A, 301 C., 301-37-152, 3309 and 333 developed to a very limited tent and produced only thin useless canes.

On the subject of the use of Riparia-Berlandieri-Teleki hybrids , 5, 6, 7, 8 and 9) no opinion can be formed until the new plants selected Dvor have been tried. They are hybrids which represent a mixture of rms.

In the nursery, where the soil is a heavy loam, difficult to work, the ttings, some of them grafted and others ungrafted, are set to root. os. 219 A, 301-37-152, 301 A, B and C, 3309 and 333 strike root in insuffint numbers, as in fact do all the hybrids of the third group. The others ike roots in the proportion of 50 per cent. and some even above per cent.

In grafting, the successes attain as much as 63 per cent. In a grafting periment carried out in 1910 with Hengel St. Severinus' grafting machine e same percentage of successes was scored as by hand grafting, but it s observed that in machine grafting the stock does not keep the scion so ll as with hand grafting. In the percentage of successful grafts no diffeice was observed between those stocks which had been previously forced

in a greenhouse and those which had not been so treated. The lowest per centages of successes were those with Riparia-Monticola 1 R (20.2) Aramon Ganzin (29.8), Riparia-Berlandieri (33) and Aramon-Rupestris 143 B (33.3)

The experimental nursery for grafted vines (1.04 acres) is situated on highly calcareous soil (68 to 72 per cent. of carbonate of lime). It has been planted gradually since 1906. In this nursery the behaviour of each hy brid when grafted is different from that which it shows when ungrafted for this reason the test of the various grafted hybrids is very important.

From 1906 to 1912 inclusive, 1270 vines, grafted on all the above mentioned hybrids, were planted. Their development, notwithstandin all the care bestowed on them, cannot be said to be satisfactory. Chloros attacks more or less all the grafted stocks, so that it has already been ne cessary to uproot 521 of them on account of their excessive weakne (partly also on account of phylloxera in the case of Sol.-Rup 1616, 101-1 and 106-8). The vine " Grüner Sylvaner " suffers severely from chlorosi especially on 1616, Aram.-Ganz. 106-8 and on the Teleki hybrids 6, 7, 8, and 10a. This vine adapts itself badly to 1616, for during the six years th it has been grafted it has been sickly and has never yielded any crop. Gr ner Sylvaner has hitherto succeeded only on Rip.-Mont. 1 R ; Weis Riesling succeeds well, that is without suffering too badly from chloros on Aramon-Ganzin 1202, 420 A, 33 and 34 E. M. Solon.-Rup. and 1 Gutedel (Chasselas) planted in 1906 and 1907 is relatively healthy only 1616 and on Aram.-Rup. ; on 106-8 it has already become sickly. Weis Burgunder (Pinot Blanc) planted in 1908 is of all scions employed the o which has been most successful on the hybrid stocks ; on 1 R and 41 B succeeds very well and on Aram.-Ganz. and on 1202 satisfactorily.

The productiveness of all these grafted stocks is very low.

Of the 45 hybrids which have been experimented upon, only those the first group (and in this excluding 106-8 which does not resist the atta of phylloxera) can be taken into consideration for soils as calcareous those of Dvor. Nevertheless the experience gained at Dvor during years already allows the conclusion to be drawn that in such soils viticult has not much chance of success even adopting these hybrids.

748 – **Self and Cross-Fertilization Experiments with Vines.** — GARD, M. in *R de Viticulture*, Year XXI, No. 1069, pp. 649-656. Paris, June 11, 1914.

Referring to previous work (1) an attempt is made to determine relative importance of different methods of pollination in vines and variation which occurs according to the nature of the vine and the gen external conditions. Three methods of pollination are distinguish 1) self-pollination ; 2) pollination by another flower on the same plant frequently on the same bunch ; 3) cross-pollination. Flowers are of kinds: *a*) those which do not open at all ; *b*) those which open like ordi phanerogamic flowers, the petals remaining attached to the floral recept *c*) those which raise the corollary hood but do not push it right off with in certain natural and artificial hybrids, such as Croton, 117-4 Coud

(*Ed.*)

(1) See No. 1430, *B.* Oct. 1912.

etary, 150 Seibel, Concord, Jacquez, Black Hawk) ; and *d*) those which in the normal way. In wild species numerous male plants exist and s-pollination is the rule, the hermaphrodite plants having short, curved nens and being self-sterile, while in the European cultivated vine there distinct tendency towards self-pollination.

Certain cultivated species also have short, curved stamens, which, lowering time, rapidly grow out of reach of the stigma ; a number of h plants were selected and a bunch of grapes on each was freed from pened flowers with the exception of a single bud left at the extremity he bunch; this was enclosed in a bag and when about to open, the cap lifted and pollen from two of the anthers was shaken over the stigma ; itive results were obtained in all the following cases : *Vitis cordifolia* flowers), Black Eagle (4 flowers,) Jaquez d'Aurelles (7 flowers), Blue ourite (9 flowers), Massassoït (5 flowers), Catawba (1 flower). Some of flowers fell off at once while others dried up gradually.

Whole bunches of the varieties Jacquez d'Aurelles and Blue Favourite put into paper bags and showed that the flowers of a particular bunch not inter-sterile. Castrated flowers of Jacquez d'Aurelles and Massit were also successfully fertilized by pollen from another bunch on the plant. Fifteen castrated Massassoït flowers gave positive results Black Eagle pollen.

The Cultivation of Olives in Tunis. — GUILLOCHON, VERRY, TOURNÉROUX nd ROBINET, in *Bulletin de la Direction Générale de l'Agriculture, du Commerce et e la Colonisation*, Year XVIII, No. 77, pp. 268-296. Tunis, May 1914.

After a few historical notes on the cultivation of olives in Tunis, the ers discuss the various methods of propagation from seed, suckers, ings of different kinds and grafts. The number of cuttings to be obd from a tree was determined ; two trees were chosen, both about ndred years old ; one, with a solid trunk, produced 400 cuttings hing about 1 lb. each, and the other, with a hollow trunk, produced 280 ngs.

In Northern Tunis the olive groves are nearly all under the control e Ghaba, which is an organisation founded to encourage the production ves. The distribution of the groves in the various districts is as follows :

District	No. of olive trees
Grombalia	1 843 066
Tunis	1 026 704
Bizerte	476 631
Kef (including Temboursouk)	91 440
Beja (including Medjdez-el-Bab)	74 986
Maktar	72 303
Souk-el-Arba	83 798
Total	3 668 928

n Central Tunis the olive groves are found in a coastal belt about les long and from 2 ½ to 12 miles wide. The land is undulating

and those portions which are unsuitable for planting serve as catchm areas, being provided with trenches 2 to 6 ft. wide to lead the water i reservoirs. Groves may contain from 30 to 60 trees per acre. Th distribution in the various districts in 1913 was as follows:

District	No. of olive trees
Sousse	4 578 495
Kairouan	186 062
Tala	11 106
	4 775 663

In Southern Tunis the rainfall is very irregular so that plantations y a less uncertain crop than annual plants and amongst trees the olive dominates. The following numbers existed in 1913:

District	No. of olive trees
Sfax	2 803 642
Gafsa	196 743
Gabes	65 588
Military circle	259 633
Total	3 325 606

Numerous varieties are grown, both for the production of oil and pickling, the most prevalent of the former kind being the Chitoui and Chemlali of Tunis and Sfax.

The cost of harvesting, which is done either by hand picking o knocking the fruit off with a pole, varies from 10 to 12 fr. per "caf (5*d* to 7*d* per bushel) in a good year to 40 fr. (2*s* per bushel) in a bad y In those groves under the control of the Ghaba, the olives are sold auction; the owner then pays 20 per cent. and the buyer 3 per cent the sale price to the Ghaba for managing the grove; usually a net re of 4*d* to 10*d* is obtained per tree, but the crop is very uncertain and va from 48 000 tons in 1911 to 5000 in 1910. In Central Tunis the yiel also vary variable; from data obtained during five consecutive yea is estimated that a return of 5 or 6 per cent. should be obtained. In south, olive trees under good management are estimated to produce:

at 8 years	¼ to ½	bushel per tree
» 10 »	½ to 1	» » »
» 15 »	1 to 3	» » »
» 25 »	3 to 5 and 7	» » »

The trees may be expected to maintain their yield for a conside time under good management.

Oil extraction is carefully done in Tunis, and the oil is chiefly in France and Italy. The relative production of oil in the northern, c and southern regions respectively is about 1 : 1 : 4, the total prod being as follows:

	Production in hectolitres (1 hl. = 22 galls.)	Value per kg. in frs.
1900	339 800	0.70
1901	265 200	0.70
1902	161 770	0.62
1903	392 500	0.62
1904	255 650	0.62
1905	244 800	0.62
1906	243 000	0.62
1907	392 900	0.60
1908	68 000	1.00
1909	420 000	1.00
1910	550 000	1.00
1911	420 000	1.00
1912	205 000	1.50
1913	345 000	1.50

Numerous parasites, both insect and fungoid, attack the olive trees unis. The Government does a good deal to encourage the cultivation lives; over and above the institution of the Ghaba, pruning competis are held, and it is compulsory that all fallen fruit should be collected rder to check the propagation of the olive fly (*Dacus oleae*); further, rafted olive trees are exempt from land tax (canoun) for fifteen years.

- Avocados: *Persea gratissima* Gaert. and *Machilus glaucescens* Wight. — RIVIÈRE, C., in *Journal d'Agriculture tropicale*, Year XIV, No. 155, pp. 132-37. Paris, May 31, 1914.

Machilus glaucescens is still somewhat unknown as a fruit tree. The is not as large as that of the avocado, sometimes more drawn out, ys green with somewhat oval and pointed seeds. The flesh is greenish similar to the avocado in consistency and flavour. The tree is prolific, cially every alternate year, and more resistant to violent fluctuations imate than the avocado. Its hardiness should make it very suitable stock for the avocado; methods of cultivation are identical for two plants.

LIVE STOCK AND BREEDING.

- Investigations on the Presence of Tubercle Bacilli in the Flesh, Blood, and Intermuscular Lymphatic Vessels of Tuberculous Calves. — HAEUTLE, CHR. in *Centralblatt für Bakteriologie, Parasitenkunde u. Infektionskrankheiten*, Vol. 74, Part 1-2, pp. 91-130. Jena, May 27, 1914.

The writer made intraperitoneal injections into 161 guinea-pigs and bbits, with blood, muscular-serum, and serum obtained from the intercular lymphatic vessels of 36 more or less tuberculous calves, with iew to solving the question of the pathogenic power of bovine tubercus. The most important results may be summarized as follows:

1. In the case of fat calves suffering from severe tuberculous inion of the spleen, liver, kidneys, lungs and so-called lymphatic vessels he flesh, no infection of the blood is as a rule discernible.

2. No tubercle bacilli can be discerned in the muscular tissue of tuberculous calves, even in those cases in which the lymphatic vessels immediately connected with it shew tuberculous lesions or swelling.

3. Tuberculous infection of the lymphatic vessels may be present, even if they exhibit no tuberculous lesions ; and in the case of such fresh infection of the lymphatic vessels, still imperceptible macroscopically, the muscular tissue proves free from tubercle bacilli.

4. The macroscopically latent infection of the lymphatic vessels in a calf does not presuppose the infection of the blood by tubercle bacilli. The infection of these vessels must, in the absence of infection of the blood be considered as communicated through the lymph ducts from othe already infected vessels.

5. The mere swelling of a lymphatic vessel of the flesh is not invaria bly to be regarded as a definite indication of the infection of that vessel o of the muscular region connected with it, and in the same way the fact tha a vessel retains its normal shape and size is no guarantee that it is fre from tubercle bacilli.

752 - **The Importance of the Inorganic Constituents of Feeding Stuffs.** - ZAITSCHEK, A., in *Allatorvosi Lapok*, Year 37, No. 19, p. 225. Budapest, May 9, 19

In collaboration with St. Weiser, the writer instituted investigatio into the influence of the inorganic ingredients of foodstuffs or the develo ment of bone in young pigs. The experiments shewed in the first pla that when the animals were fed exclusively on maize, they excreted, in spite of putting on muscle, more calcium than they retained, and ma up the deficit with magnesium. Later, when the quantity of dry food w raised somewhat (from 700 gms. to 918.9 gms. for example, in the case a pig weighing 98 lbs.) and 5 gms. of calcium carbonate added to the mai food, the deficit in calcium was replaced by a heavy increase, the amou of magnesium retained falling at the same time from 0.5092 gm. to 0.10 gm. Simultaneously the quantity of phosphoric acid retained rose from per cent. to 30.1 per cent. When the pig, weighing 115 lbs. was fed on barl only, getting 900 gms. of barley and 160 of starch every day, a slig surplus of calcium resulted, which was not sufficient to ensure a corresp ding development of bone. An addition of 3 gms. of calcium carbonate the daily ration produced a high absorption of calcium and phospho acid.

As the minimum quantity of calcium required depends on a vari of circumstances, it cannot be definitely indicated in such a way as to ad of growing pigs bring kept accurately balanced as regards calcium. the experiments, a high absorption of calcium and phosphoric acid resul when 10 or 11 gms. of calcium carbonate were added to the food 100 kg. of live-weight. When young pigs were fed exclusively on ma or maize and barley, the bones did not develop properly but seeing t both maize and barley contain phosphorus in sufficient quantity, it app unnecessary to use the more expensive calcium phosphate in place calcium carbonate. Pigs reared in the open usually pick up lime al

earth, etc. and therefore under such circumstances it is superfluous ve them lime; but animals, and especially young fattening pigs, in ty, cannot supply their requirements as regards lime, and the lack nly too easily renders the fattening process unsuccessful.

Feeding Experiments with Lupin and Horse-Chestnut Flakes. — HAUSEN, EISCH, EWALD and LILIENTAL in *Illustrierte Landwirtschaftliche Zeitung*, Year 34, os. 42 and 43, pp. 391-392 and 399-400. Berlin, May 27 and 30, 1914.

The writers conducted some feeding experiments with lupins and horse chestnuts deprived of their bitter principles by a new German ss (1) and rendered suitable for feeding purposes. They used only lakes prepared from blue lupins and from horse chestnuts without other admixture. The contents in nutritive matter which the s compared with previous analyses by Bässler are the following:

	Lupin flakes		Horse-chestnut flakes per cent.
	Writers' analysis per cent.	Bässler's analysis per cent.	
atter	82.0	91.4	85.0
protein	25.7	27.7	6.7
rotein	22.9	—	5.1
fats	4.0	2.1	3.9
n free extract	36.3	42.6	67.8
	9.1	11.2	3.5
	7.2	7.7	3.2

he lupin flakes still had, as Bässler had also observed, a fairly bitter ; their alkaloid content was 0.18 per cent.

f the coefficient of digestibility for disembittered lupins and for horse uts given in the literature on the subject be taken for these new , they would contain the following amounts of digestible food:

	Dry matter per cent.	Crude protein per cent.	Fat per cent.	Carbo-hydrates + crude fibre per cent.	Protein per cent.	Starch value per cent.
lakes	82.0	23.4	3.5	41.8	20.6	63.8
t flakes	86.0	4.0	3.3	63.0	2.4	72.4

(1) The process, invented by VON FEHRENTHEIL of Liegnitz, is described and illustrated by OEPFNER in *Illustrierte Landw. Zeitung*, No. 6, 1912.
See *Landwirtschaftliche Wochenschrift für Pommern*, p. 12, 1911.

Lupin flakes are therefore a food rich in protein and chestnut flake starch.

The animals experimented upon were cows and sheep; it was inten to feed them with both kinds of flakes, but the cows refused the lu on account of their bitter taste and so only chestnuts were given to th

I. *Fattening lambs with lupin flakes.* — The animals experimen upon were 24 yearling lambs divided into two equal groups. The group was fed a basal ration of meadow hay, mangolds and barley gro and as food for purposes of comparison 0.4 lb. of bean groats earthnut meal per 100 lbs. live-weight. The second group got the s basal ration plus 1.1 lb. of lupin flakes per 100 lbs. live-weight. experiment proceeded without any noteworthy incident, the lupin fla being eaten up readily. The result was as follows:

	Group I lbs.	Group II lbs.
Increase per animal in 73 days	28.82	28.38
» » per day	0.396	0.389
Carcase weight in percentage of live weight. . . .	47.9	47.9

The lupin flakes thus had the same nutritive effect as a correspondi quantity of nutriment given under the form of beans and earthnut oil

II. *Fattening lambs with chestnut flakes.* — In this experiment Hampshire lambs were employed; they also were divided into two e groups, the first of which was fed a basal ration consisting of mea hay, dried beet slices and soy bean meal, and, for comparison with chestnuts flakes, 1.1 lb. of wheat bran and 0.66 lb. of maize per 100 live-weight. The second group received the same basal ration and lbs. of chestnut flakes per 100 lbs. live-weight. During the whole t the chestnut flakes were readily eaten, and notwithstanding the l amount fed, did not affect the health of the animals. The following the results:

	Group I lbs.	Group lbs.
Increase of weight per animal in 73 days.	24.42	15.8
» » » per day	0.33	0.2
Carcase weight in percentage of live weight	48.8	45.6

According to the opinion of the butcher the lambs of the first were not perfectly fattened, but still fat enough and provided sufficient tender meat, while the lambs fed on chestnut flakes wer and their flesh was soft and watery. On the whole the chestnut proved unsatisfactory.

III. *Experiments with chestnut flakes for milch-cattle.* — Four were fed a basal ration consisting of hay, dry beet slices and soy meal and, during three periods, 0.8 to 3 lbs. of maize groats and of wheat bran per 1000 lbs. live-weight, in comparison with 2 chestnut flakes, fed during one period and 4 lbs. of the same flak

ıg another one, always per 1000 lbs. live-weight. The experiment ɔeded without any hitch and after the first three days the cows ate chestnut flakes readily enough. These flakes however had the draw-, that during the fortnight during which 4 lbs. of them were given all ows suffered from scour. The same happened when at the end of the the flakes that remained were fed to all the cows in the experimental

On the milk yield the chestnut flakes did not seem to have any t, favourable or unfavourable, from which it appears that in doses up lbs. per 1000 lbs. live-weight, they can be freely fed to cows.

From the above experiments the writers conclude that while the pre-tion of these flakes is certainly interesting, the difficulties attendant their use render it doubtful whether it will be profitable to go on pro-ıg them.

Breeding Ardenne Horses in Sweden. — ABRAMSON, ERIK. Pp. 14, Köping, 1914. Ardenne horses began to be bred in Sweden in 1873, when Count ngel imported into Värmland two Belgian Ardenne stallions. The ts obtained were so satisfactory that after a few years Count Wrangel ırted 18 pure bred stallions and 14 mares. By the early eighties the ırtations of Ardenne horses into Southern and Central Sweden had me almost general. The crosses between Ardenne stallions and native mares were more satisfactory than the native horse improved Norvegian and thoroughbred blood. It was especially in Väster-nd that the breeding of Ardenne horses reached a high degree of per-on. About the middle and towards the end of the eighties other ds, such as Clydesdales, Shires, Percherons and Pinzgauers were used rossing, but about the middle of the nineties it was clearly recognized veden that on the whole the most suitable horse for the country was the nne.

Since then the breeding of Ardenne horses in Sweden, assisted also he State, has continued to develop. Up to 1900 the distribution of s by the State was almost exclusively for outward conformation, since then the value of pedigree has been recognized. From this anization of the standards for the distribution of prizes the consoli-n of the breeding of Ardenne horses in Sweden may be said to date. rther encouragement was the foundation of the Studbook Society for ish Ardenne horses with the assistance of the State and of the agri-ral associations. It published a studbook for the whole country, hich only the Ardenne horses recognized by the State Committee for s are admitted. Up to 1913 inclusive, 4631 horses, 680 of which are ons, have been entered.

In Sweden, besides the Ardenne horses, which are the most important, her breed of heavy draught horses is raised in the most northern nces. These breeds are kept separate and serve different purposes. Ardenne horse is employed in farm work and the smaller draught of the north is in demand for work in the forests. To a small extent dales are also bred.

The State and the agricultural societies spend yearly about £17 under the form of prizes for the encouragement of the breeding of draf horses which is for the most part carried out by the peasants. stallions belong exclusively to associations formed for the purpose o private owners. In Sweden there are only very few stud farms for Ard horses, those of Blomberg in Västergötland and of Bjärka-Säby in Ö götland being the best known.

The importation of Ardenne horses from Belgium is limited at pre to only the best breeding animals for which not infrequently from to £825 are paid for stallions and £165 to £220 for mares. In ge in Sweden it is not the largest and heaviest Ardenne horse that is but a medium-sized one combining strength, resistance and agility.

755 – **Experiments on the Profitable Feeding of Milch-Cows.** — GOLDSCHMI (Royal Veterinary and Agricultural College, Copenhagen) in *Dansk Land*, Year cember number, pp. 453-470. Copenhagen, 1913. (Summarised by the writer).

This experiment is a kind of continuation of previous feeding ex ments. These latter aimed partly at a comparison between the e that is the economical result, of a ration composed according to the empirical rules and that of another composed, with due considerati the amount of nitrogenous and nitrogen-free matter in the different in a manner proportional to the yield of milk of the different cows experiments were also carried out to demonstrate that the so-called valents (" Ersatzzahlen "), the use of which during the last decade spread greatly in Scandinavia and other countries, cannot be used al when it is a question of compounding profitable rations for milch-co though they may perhaps be useful in the calculation of the money va of the food. Besides, these experiments serve to detect some errors the feeding of cattle, as for instance using straw *ad libitum*.

The present experiment, which takes, lucerne as basal ration, is be considered as a preliminary one ; especially as lucerne is still of atively recent introduction in Denmark.

In the experiment two groups of ten milch cows each were employ At first, during the period of observation, the cows were fed exclusiv on lucerne *ad libitum*. It appeared in this period, among other thin that the weight and performance of the individual cows did not st in any approximatively constant relation to the quantity of lucerne c sumed, and that the older and drier the lucerne, the less of it was eat

In the experimental period which followed the observation period cows of both groups were given 77 lbs. of lucerne and 2.2 lbs. of str but while Group I received also 1.02 lb. of oilcake (containing prot for every 10 lbs. of milk, Group II received a quantity of oats correspond to the equivalent figures (Ersatzzahlen), namely 1.33 lb. for every 1 of milk. These rations were fed for the first 25 days, after which, for remaining 20 days of the experiment, Group I was fed oats and Grou oilcake.

In both groups oilcake produced the greatest yield of milk. If equivalent numbers had been correct, under the above mentioned co

ıs the two concentrated foods should have had the same effect upon production of milk.

That the addition of oilcake to a forage so rich in protein as lucerne ; able to cause a relatively greater increase in the milk yield than the s is due not only to the fact that the content of digestible protein in lucerne (77 lbs.) was not large enough without further addition to er the want of this substance, but also to the fact that the relatively ge amount of nitrogen-free matter contained in the oats was not capable balancing the comparatively low content of protein in this food. or,)ther words: the above result shows that it is comparatively easy to :e the yield of milk by the use of protein at the expense of the fat tained in the body, when the cows are in good condition (which was the e in this experiment), while it is difficult to do so with carbohydrates the expense of the protein-containing tissues of the body.

Accoıding to the calculations which have been made on the basis the analyses of the foods employed in the experiment and according the quantities of milk obtained and the weights observed (test milkings re made daily and the cows were weighed every 5 days,) the following ıclusions were drawn :

1. Lucerne alone can only exceptionally and temporarily afford ofitable food for milch cows.

2. Lucerne combined with other food is one of the best fodders for ı cows. In proper proportions lucerne is admirably suited to increasing)rofitableness of cattle keeping.

3. Under the given conditions, when it was a question of compound- .n economical ration for cows in excellent condition, the addition of ke, to a limited quantity of lucerne (77 lbs.) was more favourable to yield of milk than a corresponding quantity of oats (on the basis of valents).

The results of the experiment show further that the substitution of s rich in protein by those rich in carbohydrates may produce exactly same milk yield without justifying the conclusion that in any parti- r case one food can effectively replace a corresponding quantity of)ther food. This observation has long since and repeatedly been made he writer.

On the basis of these results and the considerations to which they give a series of general rules may be established for the use of lucerne dur- the various periods in summer.

1. As long as the lucerne is young, that is up to about the 15 th. of ;, it is to be supplemented by mangolds (or if necessary cereals, etc.).

2. From the 15th. of June to about the 15th. of August lucerne, g older, is to be fed with oilcakes, or, if it is fed in smaller rations, with ıke and cereals, etc.

3. From the 15th. of August to about the 10th. of September lu- ıe, should be supplemented by oilcake and mangolds.

The report contains a number of suggestions for mixtures of varying ntities of lucerne with several other foods.

756 – **Investigations into the Metabolism and the Potential Energy of Food Growings Pigs.**—FINGERLING, KÖHLER, REINHARDT, BRETSCH, ARNDT and DIE in *Die Landwirtschaftlichen Versuchsstationen*, Vol. 86, Parts 3 and 4, pp. 145 Berlin, May 25, 1914.

These experiments are a continuation of those of Kellner on the u zation of pure foodstuffs by ruminants. The method followed diff somewhat from Kellner's: the two animals under experiment w given, in a preparatory period, a basal ration consisting of a mixtur barley groats, meat meal, phosphate of lime (" Futterkalk ") and comm salt. In the following period, pig. no. 1 was given successively, bes the basal ration, potato starch, earthnut oil, " strohstoff " (straw cellu obtained by boiling straw under pressure in an alkaline medium) and glu pig no. 2 was given meat meal (0.66 lb.) and sugar. Lastly both were fed the basal ration again, the same in quantity and quality as at beginning of the experiment. The different periods lasted 13 to 14 d (some only 12) and the observations made during this time dealt w the metabolism and consumption of energy, from which the utilizatio the food given was calculated.

The result of these investigations demonstrated that pigs utilize productive parts of food to a greater extent than is the case with ruminan When the individual foods are given separately in an easily digesti form, as in gluten meal, starch meal, earthnut oil, " strohstoff " and sug their higher utilization by pigs as compared with the same by mat cattle is as follows:

Gluten protein	35.1 per cent.
Fat	31.8 » »
Carbohydrates	30.0 » »
Crude fibre	0.0 » »
Sugar	32.1 » »

With the exception of digestible crude fibre, which is not more utili by pigs than by cattle, the better utilization of the different foods attai nearly the same value. It appears thus that Kellner's starch valu which are only relative figures, may be used also for calculating the ratio of pigs, all the more as crude fibre has only a secondary importance the rations usually given to pigs.

757 – **Rearing Ostriches in Madagascar.** — *Bulletin de l'Office colonial du Minis des Colonies*, Year VII, No. 76, pp. 189-200. Melun, April 1914.

The ostrich farm at Tulear made satisfactory progress during 19 and another is being established at Befamany. The diet of lucerne ha proved very healthy for the birds whose plumage has considerably im proved, the tail feathers of the male birds fetching as much as 36 s per lb Anthrax has accounted for a good many deaths and it is suggested tha the anthrax organism is able to live in the body of the ostrich as a sapro phyte, becoming pathogenic when the general health of the bird is bad the fact that large numbers of the organism are found in the body of ostrich who have died after excessive exercise, lends support to this hypothes

Mulberry Leaves Preserved in Cold Storage. — BUFFA, P., 8 pp. Riccardo Bi-ntina, 1914.

re than a ton of mulberry leaves were distributed in 39 boxes of zinc or wood and in various sizes; the boxes were closed and in cold storage at a temperature of 2° C. (35.6° F.) from June to August, which they were used to rear silkworms and compared with fresh s for that purpose. Atmospheric conditions were most unfavourable ghout the experiment.

From the results obtained the following conclusions were drawn:

1. Large quantities of mulberry leaves can be preserved by means ld storage.

2. The temperature of the storage chamber should be constant een 1° and 2° C. (33.8 and 35.6° F.).

3. It is better to precool the leaves for a few hours before putting into the storage chamber.

4. The containing boxes should not be of greater capacity than 3 cu. olding 56 lbs. of leaves) and should be packed in the chamber in such y as to allow free ventilation in all parts.

5. Stored leaves were eaten with as much relish by the silkworms sh leaves and gave equally good results with regard to both the worms he cocoons produced.

6. The cost of storing the leaves in a chamber of 4200 cu. ft. capacity nted to 1*s* 9*d* per cwt.

Sericultural Products in Persia. — LAFONT, F. in *Bulletin mensuel de l'Office es Renseignements agricoles*, Year XIII, No. 4, pp. 418-420. Paris, April 1914.

The trade in silkworm eggs in Persia is practically entirely in the hands reek merchants who obtain nearly all their graine from abroad. There however, a few isolated breeders in Persia and a certain amount of lected graine is also produced and sold fraudulently as imported ted graine. Imports during the past 8 years are given in the follo-table.

Imports of graine in ounces of 25 gms. (= 0.88 *oz. avoir.*).

1905-1906	242 413
1906-1907	346 202
1907-1908	398 156
1908-1909	—
1909-1910	322 246
1910-1911	308 782
1911-1912	372 640
1912-1913	280 000

our-fifths of the imports come from Turkey, and the rest from Russia, insignificant amounts are obtained from France and Italy, the impor-of graine from western countries being impeded by local prejudice. ggs are usually sold on credit the cash price being about 4*s* per oz. gms.

There are no statistics as to the production of cocoons in Persia, b this is estimated at 5950 tons of raw material per annum. This low pr duction is due to defective rearing methods and to the poor quality of t eggs which are frequently diseased. The cocoons are of poor qualit and fetch 7*d* to 8 ½*d* per lb. in the raw state; they are chiefly export to France and Italy; those not exported are worked up by the cultivato themselves, who only have very primitive apparatus at their disposal a turn out a rough, faulty, dull tissue which would be unsaleable in Europ the best qualities are worth 8*s* 6*d* to 9*s* 3*d* per lb. according to the st of the European market. Not more than about 120 tons of waste is pr duced per annum, best quality floss fetching about 1*s* 6*d* per lb. at Const tinople.

It would certainly be more profitable to export the silk in the form good reeled silk than in the form of cocoons and there would seem to be opening for European reeling mills in Guilan, Mazanderan, and Khoras The present production would require about 20 000 modern reeling un The chief obstacle to the establishment of such mills is the mussulm customs which prevent men from entering the workshop where wom are working, consequently preventing proper superintendence of the wo

FARM ENGINEERING.

760 – **New Implements used at the Flahult Experiment Farm, Sweden, in Year 1913.** — AKERBERG, H. in *Svenska Mosskulturföreningens Tidskrift*, Year XXV No. 2, pp. 147-154 + 7 figs. Jönköping, March 1914.

At the Flahult Experiment Farm the following implements w tested last year: a dung spreader, a Swedish lime and artificial manu spreader, a combined field leveller (Ackerschleife) and spring tooth harr a rotary harrow and three different ploughs.

The *dung spreader* is built for one horse and consists of a cart w a moveable bottom, which, like an endless chain, carries the dung towa the back of the cart, where a distributor scatters it in a finely divi state behind on the same principle as that adopted by the large man spreaders of the International Harvester Co. The width over which manure is spread is 4 feet. One man and one horse working 10 h can manure from 1 ¼ to 1 ½ acres a day at the rate of 8 tons to the a The machine is therefore suitable for small farms. The work done excellent with both large and small quantities of peatmoss dung.

The "*Albion*" *artificial manure spreader*, which is built chiefly spreading pulverized lime, was used for basic slag and potash salts. work done was satisfactory, but attention had always to be paid to speed at which the machine was driven, as this influences the quan distributed. When the weather was damp the spreading was not so g Further experiments with superphosphate showed that this fertilizer ca be spread with the machine, as it is liable to choke it.

The *field leveller and spring-tooth harrow* " Svensk " was tried on a and on sandy soil, but with no great success, as the soil was too loose. heavier and firmer soil it appears to work better.

The *rotary harrow* " Hankmo " from Finland resembles Wassis' spade ow, but differs from it in that the axles are adjustable and the spades replaced by narrow, pointed, slightly curved blades. This harrow tried on moor and fen land, as well as on sandy soils ; it was used ploughed land, stubble and after beets, and every where worked satisorily. On old, stiff, unbroken meadows the soil was rendered fit sowing by going over it twice with the Hankmo and once with a othing harrow. It requires considerable draught in consideration of width of work done.

The *swing ploughs* Reval 1 and Reval 2, built by the Swedish Norramar works, for Russian moor soils, were used on moor and fen land. 1. proved very useful for cultivating and for breaking up old stiff tusy meadows. No. 2, was not so good for moor soils.

The third *plough* tried, the " Victoria ", was built on the American ion type. The specimen tried had been specially modified for moor . On old compact moors the performance was satisfactory ; for loose, erfectly decomposed or wet moors it is not so suitable. On mineral it worked admirably.

- **Tile-Drain Trench-Digger.** — *Engineering*, Vol. XCVII, No. 2525, p. 708. London, May 22, 1914.

In countries where irrigation is recent, as in America, South Africa, etc., tendency has been rather to neglect drainage, with the frequent result aterlogged soil and a consequent falling off in the crops.

Where the tracts of land are large and labour scarce, drainage presents culties, which tend to the mechanical treatment of the problem. Thus mechanical excavator has been adapted to this kind of work. The mpanying figure illustrates a successful form of tile drain ditcher t by the Austin Drainage Excavator Co., of Chicago, U. S.

It is constructed to travel over soft ground. Eighty-five per cent of 5 ½ tons that the machine weighs is supported by an endless chain lat feet on each side and at one end of the machine. The pressure per are foot on the ground is only 390 lbs. The other supporting wheels of the usual broad-tyred pattern and they are not near the trenching rations.

The trench is cut by a series of scoops or buckets, with lips of forged l, attached to an endless chain and carried by a ladder or boom which inged at one end to a vertical frame, on an extension of which pass the les for adjusting the height of the ladder.

The buckets can easily be fixed or removed from the chain. They made three sizes : 10, 12 and 15 inches, which, with side cutters, re trench widths of 12, 15 and 17 in. respectively. The buckets are ned of their contents by a strong fixed scraper which clears clay as tively as light soil. The material brought up is delivered by the belt conveyor to one side of the trench.

The ditcher can excavate to a depth of 6 ft. according to the positio of the ladder.

For usual conditions, making a cut 10 to 15 in. in width, 6 ft. dee and advancing at the rate of 15 ft. per minute, a two-cylinder 14 to 16 H petrol engine is mounted on the machine. Steam power can be applie if preferred. It is self-propelling and moves on roads at 1 ½ to 3 mil an hour. It can turn in its own length.

It is estimated that the cost of running under normal conditions i the United States, including repairs, is less than $10 per 10-hour da Large sized ditchers cut trenches up to 40 in. wide and 12 ft. deep.

762 – **Spring-tooth Cultivator.** — From Report of Patents, in *Wiener Landwirtschaftli Zeitung*, Year 64, No. 18-19, p. 164. Vienna, March 21, 1914.

The novelty in the cultivator recently patented in Germany in Cl 45 a, under Number 60 999, consists in the flat spring teeth being lateral twisted in their lower extremity (see fig. 1). By this means the tee can, according as they are raised or lowered and turned inwards or outwar increase or diminish the heights of the ridges and adapt themselves to a form of ridge or bed and distance of rows. In the framework *a* are fi two pivots *b* round which square axles *cc'* can turn. The spring teeth are fixed to the axles by clamps *ff*; a connecting rod *i* unites the leve *hh'* attached to the axles *cc*. The lever *h'* is lengthened to an adjustal hand lever *h''*. The position of the wheels *n* can also be regulated a to height and width of gauge. Each of the spring teeth can be so shifte as to correspond to the shape of the ridge to be worked (see fig. while the depth to which the teeth penetrate into the soil is regulated b turning the axles *cc*.

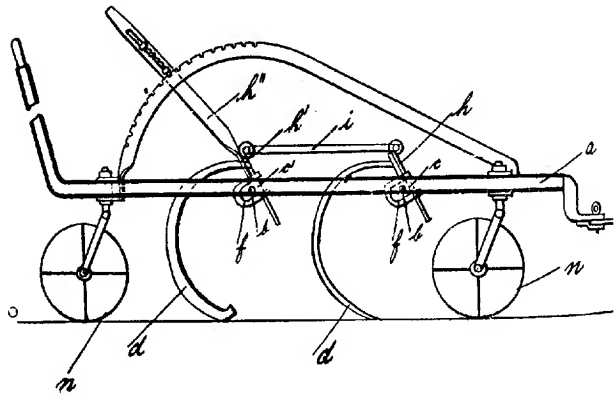
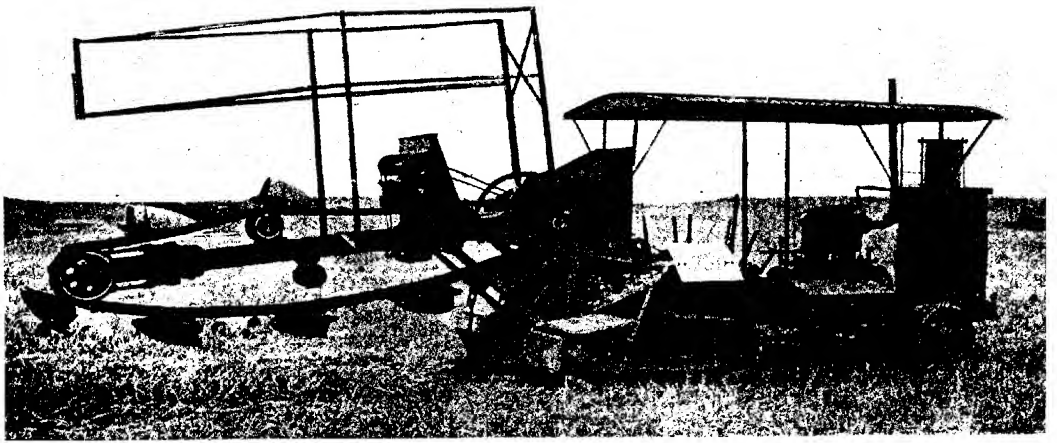


Fig. 1. — Spring-tooth cultivator (side elevation).



Tile-drain trench-digger made by the Austin Drainage Exavator Co., Chicago, U. S. A.

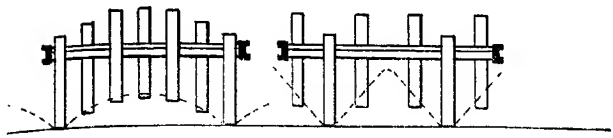
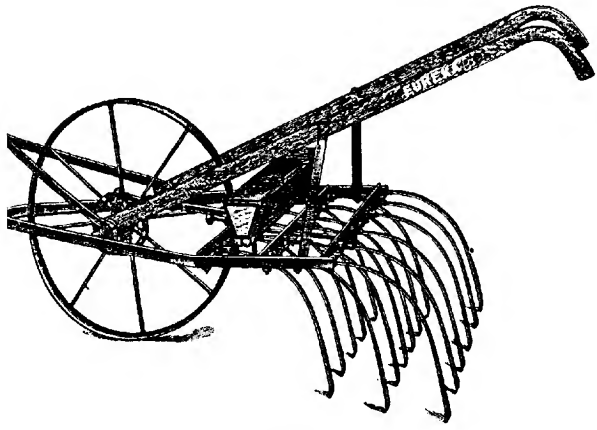


Fig 2. — Spring-tooth cultivator, showing adaptation of teeth to ridges.

A New Mulcher and Seeder. — *Farm Implement News*, Vol. XXXV, No. 16, p. 32. Chicago, Ill., April 16, 1914.

The new three-foot mulcher and seeder shown in the accompanying cut has lately been placed on the market. It is described as a mulcher, smoothing harrow, surface cultivator, seed sower and weeder, all in one. It enables farmers to sow grass seeds or grain between rows of other plants. The teeth cover the seed perfectly and level the ground. One horse only is needed.



A new mulcher and seeder.

Combined Horse-Hoe and Roll for Beets. — *Blätter für Zuckerrübenbau*, Year XXI, No. 10, p. 161 + 3 figs. Berlin, May 31, 1914.

This device is patented in Germany under No. 267 840. It allows several rows of beets being hoed and rolled at the same time.

The rollers and the hoes work independently of each other and c adjust themselves to inequalities of the field, being attached by separ arms, *b* and *d* (see fig. 1, side view, and fig. 2, plan), to the frame, *a*,

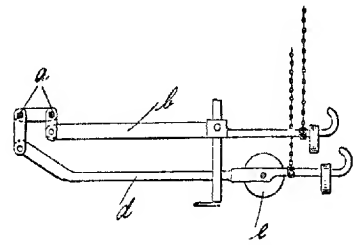


Fig. 1. — Combined horse-hoe and roll for beets (side elevation).

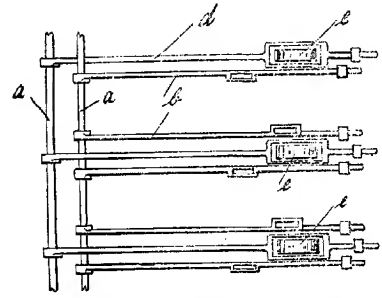
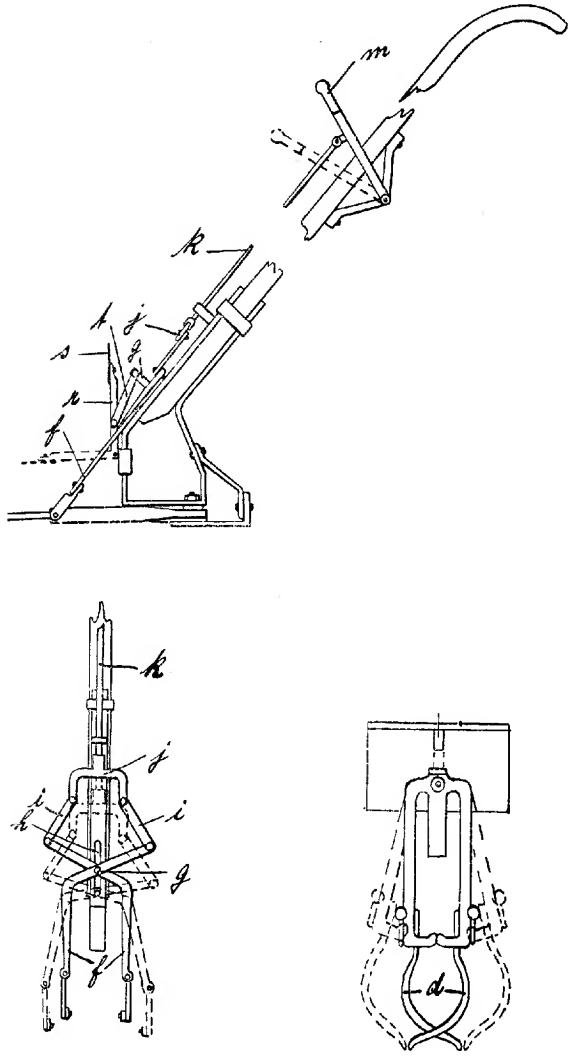


Fig. 2. — Combined horse-hoe and roll for beets (plan).

the machine. In heavy soils both hoes and rollers are provided wi weights (*f*). The machine is fitted with steering gear fore and aft, so to ensure the greatest precision of work.

765 – **Hand Beet-Lifter.** — *Blätter für Zuckerrübenbau*, Year XXI, No. 8, p. 129 figs. Berlin, April 30, 1914.

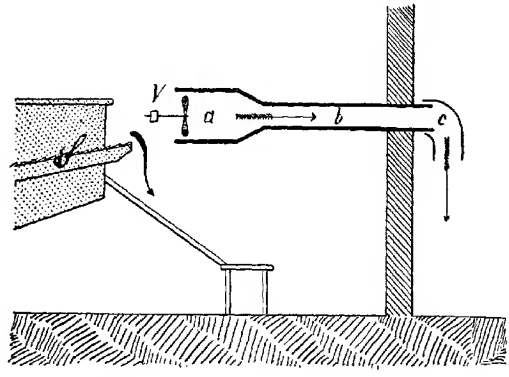
The hand beet-lifter shown in figs. 1, 2 and 3 is patented in Germa under No. 267230. It lifts and tops at the same time ; the cutting bl is fixed by an articulated joint to the rest of the implement in such a w that it assumes a position parallel to the jaws when these are open turns up when they are closed. For opening and shutting the claws lifting and lowering the blade *s*, the hand-lever, *m*, is used. It a upon the connecting rod, *k*, a cross piece, *j*, the joint, *i*, and the claw the bolt, *g*, of which works in a slot, *h*.



Hand beet-lifter.

766 - **Apparatus for Removing Dust while Threshing.** — DUVAL, CH. in *d'Agriculture Pratique*, Year 78, Vol. I, No. 20, p. 624, Paris, May 14, 1914

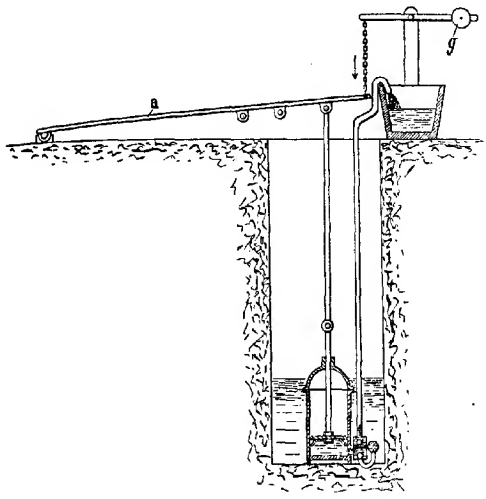
The accompanying figure is a sketch of an apparatus used for s years by the writer to remove dust while threshing. The screw-f rotating in front of the shakers, leads the dust into the pipes *a*, *b*, as by the arrows. The diameter of the fan and of the pipe *a* is about 40 i while that of the pipe *b* is only 24 inches. The moveable bent p allows the action of the wind to be counteracted. The main pipe is 15 ft. long and the dust can be driven a distance of 40 ft. The cost apparatus is from £16 to £20.



Apparatus for removing dust while threshing.

767 - **Pump for Watering Cattle worked by the Animals themselves.** — Hin in *Deutsche Landwirtschaftliche Presse*, Year XLI, No. 40, p. 500, Berlin, May 20

This apparatus is designed with the object of saving the labour of pu ing up water into the drinking troughs of pastures not provided w running water. The accompanying figure shows a section of the appara The animal on mounting on the platform, *a*, starts the pump, which ras certain amount of water. The counterweight, *g*, lifts the platform i its original position when the animal leaves it. A fence is placed round apparatus to prevent its being used by more than one animal at a time.



Pump for watering cattle worked by the animals themselves.

Review of Patents.

Tillage Machines and Implements.

65 192. Implement for removing weeds and the like from beet fields.
65 386. Motorplough which can be used as a lorry or power engine.
65 582. Clod-crusher.
65 584. Turn wrest plough.
264 420. Beetroot hoe.
152 930. Gang plough.
152 969. Garden weeder.
152 982. Motor plough.
153 047. Land drag.
153 079. Pulverizer, planter and weeder.
153 081. Hoe and plough.
153 103. Rolling drum plough.
153 145. Land roller.
153 165. Cultivator and weeder.
153 180. Weeder for harrows.
153 194. Plough beam.
153 268. Weeder.
464 996. Motor plough.
465 079. Machines for hoeing and singling beets.
465 650. Rotary subsoil digger.
466 103. System for fixing the moveable point of the plough.
466 287. Apparatus for anchoring tillage machines, driven by portable engines, and advancing automatically as the work proceeds.

	466 490. Ploughshare with reversible edge.
	466 754. Hoeing and singling machine for horse or motor traction.
	466 841. Kneed cultivator tooth.
	466 855. Jointed ridging plough.
Germany	272 760. Motorplough, the front end of whose frame can be raised or lowered on the front wheel.
	272 819. Screw for ditching plough.
	272 844. Apparatus for driving ploughs by electromotor.
	272 787. Driving wheel with movable projecting cleats, for agricultural machines.
	272 877. Disk harrow with adjustable counter pressure disk.
	272 879. Plough with device for ploughing in green manure.
	272 947. Motorplough with one driving wheel.
	273 289. Two-furrow turnwrest plough with one plough on each side of the beam, thus balancing each other.
	273 377. Depth and inclination adjusting device for Flemish turn ploughs.
Hungary	62 384. Motor rotary digging machine.
	62 399. New cultivator.
	62 448. Hoeing and ridging plough.
	62 470. Gang plough.
	62 503. Harrow.
	62 521. Motor gang plough with reversible motion.
	62 562. Self contained motor plough.
	62 604. Rotary cultivator.
	63 069. Rotary tilling machine.
	63 119. Driving wheel for agricultural machine, with cleats worked by an excentric.
	63 207. Device for raising or lowering plough shares.
	63 275. Weeding rake.
	63 341. Horse hoe.
	63 382. Steering gear for motor cultivator.
Italy	149 464. Device for balance ploughs to protect the headlands.
Switzerland	63 945. Toothed tilling machine.
	64 397. Ploughs.
	65 063. Motor fore carriage for ploughs in which the frame is beam the axle of the side wheels.
	65 064 and 65 065. Machines for tilling the soil.
United Kingdom	28 234 and 28 288. Rotary power cultivators.
	28 391. Cultivator.
	28 861. Hoe blades for rotary hoe.
	29 210. Hand rakes.
	29 729. Agricultural ploughs.
	29 812. Digging machines.
	29 967. Cultivators.
	303. Motor cultivators.
United States	1 091 358. Cultivator.
	1 091 273. Revolving harrow.
	1 091 131. Zig-zag harrow.
	1 091 031. Subsoiler.
	1 090 935. Steering wheel for ploughs.
	1 091 681. Implement adjusting device for cultivators and the like.

1 091 712. Hand cultivator.
1 092 632. Rotary plough.
1 092 249. Disk harrow.
1 093 421. Steering device for cultivators.
1 093 786. Weed destroyer.
1 094 201. Land roller or pulverizer.
1 094 240. Plough.
1 094 277. Motor plough and planter.
1 094 196. Orchard plough.

Manure distributors.

264 236. Mixing barrel for diluting and distributing cow dung.
272 948. Ratchet wheel and pawl drive for manure spreader.
62 483. Manure distributor.
62 837. Liquid manure spreader.
65 293. Liquid manure cart.
1 091 163. Fertilizer distributing attachment.
1 093 826 and 1 093 928. Fertilizer distributors.

Drills and sowing machines.

65 387. Potato planter.
65 581. Device for drills with sliding disks.
65 583. Dibbling mechanism.
263 848. Beet drills.
153 280. Grain drill.
153 301. Corn-hill marker.
466 098. Sowing machine.
466 525. Drill.
273 171. Potato planter in which the potatoes are taken out of the hopper by revolving forks.
273 172. Sowing machine with unmoveable agitator wheels.
273 001. Tubes for potato planters.
273 291. Potato planter.
273 378. Potato planter with several tubes each with two slides.
62 383. Improvements in dibbling machines.
62 441. Potato planter.
62 688. Seed pickling machine.
139 156. Drill.
65 469. Seeding apparatus with agitator wheels.
1 28 290 and 29 967. Seed drills.
1 091 068. Attachment for corn planters.
1 092 007. Marker mechanism for corn planters.
1 092 030. Corn planter.
1 092 358. Seeder attachment for gang and sulky ploughs.
1 093 991. Planting machine.
1 093 938. Transportable potato hole digging machine.

Reapers, mowers, etc.

65 774. Machine for hammering the blades of scythes.
263 445 and 263 446. Attachment for mowers for arranging clover and other grasses in regular windrows.
263 684. Lawn mower with cutter-bar.

Canada	153 006-7 and 153 073. Harvester mechanisms.
	153 127. Harvester,
	153 132. Sheaf-loader.
	153 229. Harvester machine.
	153 250. Lawn trimmer.
	153 284. Lawn mower.
	153 302. Stacker mechanism.
	153 333. Grain carrier.
France	465 150. Improvement in the cutter-bar of mowers and reapers.
	466 298. Improvement in side delivery rakes convertible into ta
Hungary	62 496. Hay fork with wooden tines.
Italy	139 867. Device for mowers to prevent the knives from blocking.
Switzerland	63 947. Mower with reaping attachment.
	63 948. Cutter-bar for mowers.
	64 398. Machine for hammering scythes.
United Kingdom	28 578. Scythes.
	29 497. Harvesting machine.
United States	1 091 064. Hay rake and stacker.
	1 091 105. Knife arrester for mowers or binders.
	1 091 109. Corn topper.
	1 091 747. Corn harvester.
	1 091 779. Heading attachment for Kafir corn harvesters.
	1 092 721. Harvester.
	1 092 356. Grain stooker.
	1 092 722. Mowing attachment for motor vehicles.
	1 093 108. Harvesters for beans and the like.
	1 093 109. Kafir corn topper.
	1 093 742. Header and header binder.
	1 093 906. Shock-forming attachment for grain binders.

Machines for lifting root-crops.

Belgium	263 443. Improvements in toppers and lifters for beets and other grown in rows.
	263 480. Toppers for beets and other roots.
Canada	153 281. Potato digger.
France	464 872. Beet topper and lifter.
Germany	272 820. Potato harvester with tilting scoops.
Hungary	62 403. Beet topper.
	62 495. Steering gear for beet-root lifters.
	62 663. Potato lifter.
	62 950. Root lifting machine.
	63 377. Beet lifter.
United States	1 090 871. Beet harvesters.
	1 091 823. Beet topper and digger.
	1 092 216. Beet harvester.

Threshing and winnowing machines.

Austria	65 630. Device to prevent the straw from winding round the cylin threshing machines.
Belgium	263 042. Improved hand threshing machine for all cereals.
Canada	153 054. Threshing machine.
France	465 904. Straw elevator for threshing machine.

466 566. Group of machines for threshing and cleaning wheat.
467 058. Attachment for threshers to direct the straw or sheaf elevators.
273 198. Threshing machine with feed parallel to beater.
273 490. Self feeder for threshing machine.
134 812. Shaker with large screen for threshing machines.
139 357. Automatic device for counting sacks or measures for threshing, winnowing machines etc.
140 085. Straw elevator.
63 949. Dust-removing apparatus for agricultural machines and especially threshing machines.
1 092 222. Threshing machine screen.
1 092 356. Grain stooker.
1 093 853. Grain separator.

Other agricultural machines and implements.

65 191. Tre felling and cutting machine.
65 269. Wheel especially for agricultural machines.
65 388. Turning and raking device for tedders and potato lifters.
65 772. Apparatus for watering live stock.
263 285. Improved root-cutter.
263 491. Potato peeler.
263 572. Improvement in liquid manure pumps.
263 840. Centrifugal water purifier.
263 975. Filter for rain water.
153 091. Driving device for agricultural machines.
153 120. Device for extracting traction wheels from holes.
153 123. Stacker.
153 195. Well drilling machine.
153 252 and 153 290. Cattle guards.
153 286. Rake cleaner.
464 965. Fore-carriage for agricultural machines of all kinds.
464 983. Machine for composing buttons for marking animals.
464 999. Improvement in milking machines.
465 098. Double portable fodder press.
465 148. Device for untying animals in stables.
465 475. Traction sprayer.
465 867. Metal dismountable anti-hail rocket with safety device.
465 892. Apparatus for sulphuring vines and fruit trees.
466 249. Portable forcing bed built of reinforced concrete plates without angle uprights.
466 289. Leaf fender for beet root lifter.
466 579. Machine for removing outer bark for control of insects, etc.
466 770. Apparatus for destruction of injurious animals.
272 626. Appliance for use in manger.
273 003. Machine for shelling nuts.
273 005. Automatic lamp trap for insects with separate illuminating and catching surfaces.
273 151. Protective screen for chaff cutters.
272 999. Beet singling and potato lifting machine with throw wheel.
273 492. Vertical milk separator with vessel for skim milk.
273 199. Chaff cutting machine with device for automatic sharpening of knives while working.

	273 489. Cherry stoning machine.
Hungary	62 402. Agricultural tractor.
	62 527. Combined rake and elevator for straw, hay etc.
	62 577. Hay knife.
	62 606. Cleats for motor wheels.
	62 855. Wheel for raising and lowering agricultural machines.
	62 954. Chaff cutter.
	62 981. Ladder stay for fruit picking.
	62 982. Machine sprayer.
	63 030. Dust removing apparatus for agricultural machines or threshers.
	63 093. Machine for untying sheaves.
	63 336. Appliance for cleaning fruit, seeds etc.
Italy	137 826. Device for untying animals.
	139 153. Sliding support for needle with elastic safety clutch for h straw balers.
	139 259. Wine pomace press with upward motion.
	139 261. Machine for extracting, at the same time, the essential oil, juice of lemons, oranges etc.
	139 353. Pyramid-shaped continuous feed cereal esiccator.
	139 954. Improvement in hand sulphur dusting machines.
	139 961. Machine for husking dried chestnuts.
	139 719. Grape crusher.
	139 796. Fork for agricultural and industrial purposes.
	139 938. Soil injector.
	140 162. Double flower pot with compensating reservoir, porous wall and impermeable outside.
	140 254. System of protection against hail.
	139 598. Syringe for injecting liquids into cheeses while pickling.
	140 043. Machine for peeling chestnuts.
	140 171. Apparatus for peeling scalded almonds.
Switzerland	63 950. Apparatus for fumigating trees, etc. for control of pests.
	63 951. Process and apparatus for removing honey combs from
	64 006. Apparatus for concentrating milk and other emulsion filtration.
	64 007. Apparatus for washing and removing stones from wheat and grain.
	64 008. Process and apparatus for grading and cleaning groats, grain by statical electricity.
	64 139. Grape cutting device.
	64 140. Honey separator.
	64 401. Sulphur duster.
	64 472. Milk separator.
	64 647. Window with device for catching insects.
	64 869. Animal dipping device.
	65 341. Appliance for suction milking machines.
	65 533. Milk sterilizer.
	65 666. Bee feeding box.
	65 725. Improved milking machine.
United Kingdom	28 527. Spraying machines.
	28 576. Machine for trimming plants and cultivating soil.
	28 584. Decorticating machines for Landolphia.

28 609. Apparatus for heating, cooling and drying grain.
28 657. Fruit stoning appliances.
28 671. Apparatus for pasteurizing milk.
29 009. Agricultural forks, welding etc.
29 123. Nut cracking machinery.
29 224. Cleaning sacks.
29 248. Cow milkers.
29 331. Apparatus for expressing liquids from fruits, herbs, flowers, etc.
29 369. Indiarubber coagulating apparatus.
29 635. Appliance for stoning cherries.
29 641. Apparatus for roasting, panning and drying tea.
29 648. Process of preparing peat as food for animals.
29 726. Lawn sprinklers.
30 067. Cow milkers actuated by the animal itself.
386. Extraction presses.
586. Potato peeling machines.
752. Agricultural syringes for injecting liquid manures, insect destroyers beneath the surface of the ground.
849. Apparatus for coagulating rubber latex.
916. Incubators.
1 091 371. Attachment for wind driven pumps.
1 091 401. Spraying pump.
1 091 296. Bale tying mechanism.
1 090 860. Cranberry harvester.
1 091 952. Spraying machine.
1 091 587. Draught appliance for farming implements.
1 091 974. Milking machine.
1 091 990. Adjustable tongue.
1 091 912. Hay press.
1 092 376. Steering truck for traction engines.
1 092 762. Cotton harvester.
1 093 488. Draught tongues for agricultural machines.
1 092 865. Spraying device.
1 093 862. Wind mill.
1 093 904. Silo.

RURAL ECONOMICS.

The Statistical Method and its Value for the Economics of Farming. — SAGAWE, B. in *Archiv für exakte Wirtschaftsforschung*, Vol. 6, Part 1, pp. 116-136. Jena, 1914.

In the first part of his work the writer discusses the different ways of ecting and working up material in the statistical and in the monophical methods and their advantages and disadvantages for showing connection between causes and effects in general; he then passes on the question as to which method is to be preferred and comes to the clusions that in the study of productive farms (Erwerbswirtschaften), by a combination of the two methods can the connection between ses and effects be estimated quantitavely and qualitatively in a able way.

In the second part of his work the writer treats of the importan of statistics in rural economy and of their application to research this field.

The writer attempts by means of an example, to find out how t the several methods of isolating any particular factor to be examined a tain their object, and analyses the effect of increasing intensity of cultu upon the net returns. In this connection he examines: 1) an individu farm which, in the course of several years, evolved from extensive to inten ive cultivation; 2) several variously organized farms during the sa periods of time; 3) abundant material arranged according to the statistic point of view.

With the first method the period of observation, considering the vari bility of the weather and the consequent oscillation in the crops, mu be extended to about 20 years. Then the most important factors to considered are: position as regards means of communication, conditio of prices, quality of the soil, capacity of the manager, which by their vari tion in the course of time render it almost wholly impossible to isolate com pletely the influence of the intensity of cultivation. When such is the ca the result cannot be utilized as a term of comparison. The direction the effect of individual factors can be recognized by separate monograph but as soon as their quantitative effect is to be determined the method fai The comparative monographic method encounters first of all the difficul of finding suitable objects of comparison, for if even the so-called inv untary factors of production are fairly equal and comparable with ea other, on the other hand it is impossible to eliminate the influence of t voluntary factor, the manager of the farm. Consequently it will also impossible to attain correct numerical conclusions. The comparison individual farms may afford a general view of the effect of the vario factors, but in order to calculate with precision their influence and to o tain comparable figures available in practice, the formation of groups mu be resorted to, that is to say the statistical arrangement of the data.

The use of the statistical method presupposes the existence of abunda material. But even not very abundant material can be utilized statist ally, because with suitable methods of compensation a relatively lar number of groups can be formed. In conclusion, the writer shows by practical example how the isolation of a factor can be carried out und some circumstances without forming sub-groups. He calculates the effe of the increasing intensity of cultivation on net returns in 88 farms affil ted to the book-keeping office of the D. L. G. (German Agricultural Societ

In the formation of groups connected with each other, according the compensation method of Prof. Mitscherlich of Königsberg, all t factors are fairly compensated with the exception of that of soil qualit The writer calculates the effect of the varying quality of the soil up net returns, and basing his calculations upon the difference between t net returns obtained in this way and those obtained by grouping the farm according to the increasing intensity of cultivation, he shows the influen of this factor upon net returns.

, – **Principles of Exact Investigations in Agriculture.** — Von Koppen, Wilhelm in *Archiv für exacte Wirtschaftsforschung*, Supplement 13, 88 pp. Jena, 1914.

After giving some general information on the importance of agri-tural bookkeeping and on the difference between the bookkeeping of ıncial institutions and of commercial firms, the writer treats with more ail the notion of " net returns ", about which a certain confusion has en been made between the means and the end ; in defining it also the hnique of some particular method of bookkeeping has been too fre-ıntly used, instead of explaining the result of calculations. A general inition of net returns must satisfy all methods of bookeeping. The ter proposes the following : " Net returns are the numerical expression he economic result of a farm free from debts. "

Every system of agricultural bookeeping which calculates net returns ıuch a way that they correspond to this definition must be considered tematic.

The most valuable system of bookkeeping is that which answers best the requirement of the farm manager and to the character of the n. The writer considers the systematic opening of accounts as the plest and surest way of recognizing the direction and organisation the farm. Systematic bookkeeping or bookkeeping by double entry st first of all show the various branches of the farm in such a way as llow of the sufficient examination of each branch-organ and to recognize function towards the other branches and towards the whole farm — the anism. Lastly bookkeeping by double entry must allow the cost of duction to be exactly determined.

The system of bookkeeping introduced by the writer in his farm is ed by him farm bookkeeping by groups. In his method the ledger is ınged under the form of accounts, with an auxiliary book in the n of tables.

The divisions of the whole farm into a small number of groups of ounts avoids the danger of totally separating the various production nches from the complex of the whole farm and renders the examination each branch and of the reciprocal connection between them easier. the other hand the decomposition of each group of accounts according the system of tables by means of auxiliary annexes allows of a very ailed division of the farm and of the grouping together of the similar as of accounts, in view of a very minute control, of systematic calcu-ons and of statistical observations, without causing the slightest turbation in the whole of the farm.

In the bookeeping by groups adopted by the writer the agricultural duction is divided into two groups only : crops and productive stock. utilization of the soil (crops) is considered as a whole. It is the same h the maintenance of productive live stock, which includes milch s, young cattle and foals, as well as pigs and sheep if kept. Against e two accounts of production are placed the expenditure accounts, f among which is that for labour, comprising all the labour expenses. ong the items of outlay there are the produce that is consumed and

general expenses. The first contains all the stores bought in, so far as control over the remaining stock appears necessary. All the other expens are found together in the general expenses account, which may be subdivid again as required. Lastly there are the inventories and the closi accounts.

The prices given to the produce sold are the market prices, upon whi are based those of the produce consumed in the farms itself. In order take into due consideration the rise and fall of the market prices, the writ uses a table of calculations relating to the produce of all kinds consum ed on the farm. This table is an indispensable auxiliary in bookkeeping b groups, and it must be posted up every four weeks so as to follow closel the changes in market prices. Besides the prices, the quantities also mus be carefully determined.

Of course, as in all bookkeeping, the accounts begin by an inventor and balance-sheet containing all the necessary information on the asset and liabilities. The items concurring in an increase of capital are entered as follows: The cultivable soil, having a lasting value, is inventoried a its cost price; permanent improvements likewise, while improvement possessing only a temporary duration are written off proportionately to thei duration. The farm produce utilized in the farm itself, for instance timbe for building purposes, is entered at the sale price obtainable at th farm. New plantations of trees are treated according to the same princi ple as cultivable land. The cost of the work of preparing the land for th crops, such as sowing, the seeds sown and the manures, must also appe in the inventory; only when an inventory contains these data can the profi ableness of the various crops and the cost of their production be ascertained

Following upon this somewhat general discussion, the writer explain how he deals in the inventory with the various assets and liabilities such as soil, forests, fruit plantations, improvements, roads, building machinery, live and dead stock, cash, credits and debts, etc.

After entering these various values in the inventory, they are groupe together in the balance sheet and the total capital is worked out. Th ledger is opened on the basis of the balance sheet. For technical reason it is advisable to open the accounts of the ledger only at the end of the yea During the course of the year the farmer can limit himself to the entering of all business and farming events in chronological order in his memorandu book and to drawing up his table of stores every four weeks. The memo randum books must group the figures as they are to be used in the ledg

The writer distinguishes two kinds of memorandum books:

A. Those referring to business transactions.

B. Those dealing with the work in the farm itself. The first group includes: the business journal with cash book, the labour book, the pe cash book, etc. as well as the current account book.

The second group includes the farm day book, with forage and w tables as auxiliaires, the stores and livestock account, and the princi labour book.

At the end of the year the inventary has to be posted up to date and ıe closing balance sheet prepared, but it cannot be closed until the value the stores and of the work put in the ground for the standing crops has ɔen determined.

The next steps are to close the memorandum books, to start the ledger ɔounts and to close : 1) the auxiliary accounts, 2) the cash and inventory ɔounts, 3) the general expenses accounts, 4) the stores and 5) the labour ɔounts. After this, production accounts proper are closed. The first these is the crop account, which must be divided into two parts : production " and " utilization ". Then comes the productive stock ɔount and last of all the forest account.

After this there remain the other auxiliary and closing accounts : the household and personal expense account, 7) the profit and loss ac- unt, and 8) the capital account.

ı - **Giving Farm Labourers a Personal Interest in their Work.** — SCHULZE GEORG, in *Landwirtschaftliche Jahrbücher*, Vol. XLVI, No. 1, pp. 44-88. Berlin, 1914.

An enquiry was made into the means adopted on a number of large ms for giving all hired labourers as well as managers a personal interest their work. Such means will naturally differ according to the nature the work involved, but take the general form of payment by piecework l of bonuses in the case of stockmen. The writer discusses the advant- ɜs of large holdings in many styles of farming and the possibilities of adding these advantages that personal interest in the work which is such an im- rtant factor in obtaining the best results. A bibliography is appended, gether with a copy of the question form sent to the farmers.

ı - **Piece-Work in German Farming.** — ESDEN-TEMPSKI K., in *Landwirtschaftliche Jahrbücher*, Vol. XLVI, Part 3, pp. 455-498. Berlin, 1914.

The object of this paper is to illustrate the principles followed in fix- payment of piece-work in farms. For this purpose wages in kind must considered as well as wages in cash.

Farms in Germany employ three kinds of labourers.

1. Labourers under permanent engagements.
2. Labourers under temporary engagements.
3. Casual labourers.

The first two classes get respectively two-thirds and one-third of eir wages, in kind and the rest in cash, while the third class is paid ly in cash. Assuming that for work of the same value the total wages the same, the payment in cash is lowest for the permanent hands, newhat higher for the temporary ones and highest of all for the casual ɔourers.

In practice this arrangement leads to the result that those labourers o should have the greatest interest in the prosperity of the farm get least profit from piece-work, while the other two classes are better id.

That such is the case is proved by a practical examples. On a farm the province of Brandenburg the wages per day in summer are the lowing :

Permanent labourers	8*d*
Temporary »	1*s* 1*d*
Casual »	2*s* 0*d*

Usually the wages of the casual labourers or strangers are considered as the price of labour in the locality. Assuming such to be the case, namely that the men get a daily total wage of 2*s* then the value of the wages in kind per day is:

Permanent labourers	1*s* 4*d*
Temporary »	11*d*
Casual »	—

In this farm the payment of piece-work is fixed according to the wages in cash. Taking the daily wages at 8*d*, 1*s* 1*d* and 2*s* as the piece-work payment of one day's work, then the earnings of the three classes of labourers, 1) at daily wages, 2) at piece-work pay doing twice as much work, and 3) at piece-work doing three times as much work (all calculated for 140 summer days) work out as follows:

	I Daily wages			II Piece-work doing twice as much work			III Piece-work doing three times as much work		
	£	*s*	*d*	£	*s*	*d*	£	*s*	
Permanent labourers:									
in cash	4	16	1	9	12	2	14	8	
in kind	8	18	5	8	18	5	8	18	
Total earnings	13	14	6	18	10	7	23	6	
Temporary labourers:									
in cash	7	11	0	15	1	11	22	12	1
in kind	6	3	6	6	3	6	6	3	
Total earnings	13	14	6	21	5	5	28	16	
Casual labourers:									
in cash, total earnings	13	14	6	27	9	0	41	3	

The casual labourer has thus an advantage over the permanent labourer in case II of £8 18*s* 4*d* and in case III of £17 16*s* 8*d*. The greater profit in case II is equal to the value of the payment in kind that the more permanent labourer receives and which is not considered in the piecework payment of the latter. Every further increase in the amount of work done is so much more profit to the casual labourer. This signifies that the piece-work wages of the permanent labourers, even when he is as capable as the casual labourer, are always inferior to those of the latter and to a less extent to those of the temporary labourer.

If instead of taking only the wages in cash as a basis for the payment iece-work, the total of cash and kind were taken, all three classes of urers would be paid on the same basis of 2*s* *per diem* and the wages ıll three would be :

I	II	III
Daily wages	Piece-work doingt wice as much of work	Piece-work doing three times as much work
£13 14*s* 6*d*	£27 9*s* 0*d*	£41 3 6

But as the permanent and temporary labourers also get payment in l, this must be deducted, otherwise they would receive it twice. After subtraction the three classes would be paid as follows :

	I Daily wage			II Piece-work doing three as much work			III Piece-work doing three times as much work		
	£	*s*	*d*	£	*s*	*d*	£	*s*	*d*
anent labourers:									
Total earnings:	13	14	6	27	9	0	41	3	6
Wages in kind	8	18	5	8	18	5	8	18	5
Wages in cash.	4	16	1	18	10	7	32	5	1
porary labourers:									
Total earnings	13	14	6	27	9	0	41	3	6
Wages in kind	6	3	6	6	3	6	6	3	6
Wages in cash	7	11	0	21	5	6	35	0	0
l labourers:									
Wages in cash, total earnings . .	13	14	6	27	9	0	41	3	6

Thus the daily wages of the three labourers are the same in all cases. the amount in cash varies, and the difference is equal to the value of ages in kind counted once.

From the above the conclusion may be drawn :

1) That the calculation of piece-work must not be based only on the wage but on the total wages in cash and kind.

2) That from the total wages the amount given in kind must be acted.

Only piece-work paid according to these principles will keep labourers e country, whilst the system hitherto followed has done much to drive irers away form the country, as it has been more unfavourable to the anent hands than to the temporary and casual ones.

773 – **Reclamation and Improvements in the Roman Campagna** (1). — VERRATTI, I in *L'Italia Agricola*, Year LI, No. 5. Piacenza, May 15, 1914.

A first Commission was appointed in 1870 to report on the measure necessary for reclaiming the Roman Campagna, and in December 1878 law was passed declaring the proposed reclamation to be of public utility and that the State should undertake the draining of the principal marshes while landowners should be compelled to do the subsidiary canalization further, the law decreed that the zone of reclamation was to extend in circle with a radius of 10 kilometres (6.3 miles) from the Milliarium Aureum in the Roman Forum. In July 1883 an additional law was passed enabling the Government to expropriate the owners of land in the given zone should they refuse to play their part in the scheme of reclamation, but as serious outlays were imposed on the landlords without a prospect of anything like adequate returns, and, further, as the expropriation would have involved the State in far too great an expense, the law was applied in three cases only and was then left aside. A new law was finally passed in December 1903 (No. 474), which, together with that of 1883, constitutes the combined law of November 10, 1905 (No. 647), which is still in force.

This law confirms the obligation to reclaim the land in the zone mentioned above, and in that part of the basin of the Aniene which is comprised in the Roman Campagna, with the provision that owners not wishing to conform should have their land sold by public auction, the purchaser undertaking to carry out the necessary improvements. Landlords or purchasers might receive, besides other pecuniary advantages, a loan from the Ministry of Agriculture at 2 ½ per cent, repayable in 45 annual instalments, beginning after the fifth year of the loan, such loans, which might amount to £80 000 per annum, to be furnished by State funds. Even if done by private initiative, three-tenths of the expense of making the subsidiary canalization was to be contributed by the State, the Province and the Commune. With regard to the construction of new roads required by the scheme, these were to be approved by the Ministry of Public Works, and the expense of construction shared equally by the Government and by the Commune, their upkeep being left to the Commune.

A special Commission made up of 11 members was formed to attend to the application of the law and to investigate technical and administrative questions to which it might give rise.

A further law dating from July 1910 (No. 491) comprises some addi

(1) Throughout this article, "Roman Campagna" is used as a translation of "Agro Romano", that is the territory belonging to the Commune of Rome, and not in the more general sense of all the country round Rome. The Agro Romano includes two very distinct types of country: 1) a flat belt along the coast, originally marshy, including the reclaimed areas of Maccarese, the Isola Sacra, Ostia, etc.; 2) a plain at 200-400 ft., furrowed by streams which mostly only run in rainy weather, and largely under pasture (for three months in summer) or temporary grain cultivation: to this second part colonization rather than reclamation applies. (Ed.).

ıal measures for reclaiming the Roman Campagna, which may be sum-rised as follows :

1) *Application of measures laid down in the law of* 1905 *to land situated beyond the zone inally fixed upon.* — By a Royal Decree it was made possible to extend the application of measures to land outside the given zone in certain cases where the general condition of rea or the desire to encourage private enterprise made it expedient to do so.

2) *Necessity to encourage the formation and development of centres of habitation in the re-ed area.* — To this end it was decided: *a*) that all centres of colonisation consisting of at 25 families established within ten years of January 1, 1911, and at a distance of at least ometres (3.1 miles) from the boundaries of Rome, should be exempt from all rates and taxes, or governmental, during a period of 20 years; *b*) that anyone proposing to establish a rural centre of habitation and not having the necessary building land, might apply to inistry in order to be supplied with the land by expropriation for the public good; *c*) that ivate or public enterprises, including those started by owners, with the object of esta-ing rural colonies should be assisted by a loan at 2 ½ per cent. repayable on the terms tioned above; and *d*) that the sum required for such loans should be provided by State s, the total amount being limited to £40 000 per annum beginning from July 1, 1910.

3) *Encouragement of live stock* — The State associated itself with the Province of Rome he establishment and upkeep of an Institute (Istituto zootecnico laziale) whose duty it distribute high class breeding stock suitable to the district, and to encourage the pro-ion of forage crops, dairying, etc.

4) *The provision of adequate financial means without creating new charges on the State.* — ndependent fund was started known as the "Cassa di colonizzazione per l'Agro Romano" h draws its revenue from the following sources: *a*) one-tenth of its own net annual profits; sums become available by repayment of capital invested before 1910 or any balance left n the special budget of the Ministry of Agriculture concerning the reclamation scheme; ter contributions.

With this fund the Minister of Agriculture will provide prizes and subsidies to encourage initiative and especially for making farm roads, providing water supplies for drinking rigation purposes, building cottages and other kinds of improvement.

5) *Modifications in certain articles of the law of* 1905. — The period fixed for obtaining ntribution of 30 per cent. from State, Province, or Commune towards canalization works roroged to December 31, 1915. The Government was authorised to connect up the oads with train or railway stations, where necessary.

Some of the results obtained by the application of the law are given r:

Drainage works carried out by the State. — Of 34 600 acres which are ated to require draining, about one half have already received atten-large drainage operations have been carried out at Ostia (4686 acres), Sacra (637 acres), Maccarese (10 668 acres), and smaller ones at the of Tartari, in the low ground of the Almone, in the marshes of Straccia-e, Baccano and Pantano, some of which have already been handed to associations for management. Up to June 30, 1913, the State had about £260 000 on the enterprise. At that time it was estimated another £80 000 would be required to complete the work, including nning expenses of the machinery for another five years and certain tions to be carried out on the coast between Pratica and Anzio. The drainage of the Isola Sacra and Maccarese cannot be said to have practical results in so far as cultivation is concerned, as they both

consist of grazing land over which cattle are allowed to range, and the hygienic condition is not very satisfactory. These areas have recently been brought into the zone of obligatory reclamation.

Drainage Associations. — In April 1912 the 91 Drainage Associations amalgamated to form one central society, which is to reorganize the whole system and undertake the management from a single centralized office directing all the work and receiving all contributions. A committee made up of delegates from the various constituent societies has already drawn up a scheme of organization for the central office and another relating to the contributions to be paid by the various units. This has already been approved by the general meeting of the delegates and is now only waiting for the approbation of the Ministry of Public Works before being put into practice.

Contributions to subdidiary canalization. — The contribution of 3 per cent. from the State, Province and Commune towards expenses of making the subsidiary canals on the various estates has been granted for twenty holdings at a cost of about £12 800, while grants amounting to £12 000 are being made for six other holdings now carrying out similar work.

Road making. — The law of 1905 provided for the construction of 250 kilometers (156 miles) of roads, but of these only 30 km. (19 miles) have as yet been accomplished at a cost of £41 200, while another 10 km (6 miles) are being built at a cost of £15 000 and 29 km. (18 miles) are planned at an estimated cost of £60 000.

As the city of Rome has extended, roads which were originally considered to form part of the reclamation zone have been taken over by the city, while the extension of the zone beyond the original limits has increased the number of roads fixed upon in the original plan approved by the Ministry of Public Works in 1905, and for these reasons a Commission has been appointed to modify the original plan. The revised plan is now being passed by the Ministry and provides for 250 kilometers of roads, in above those already in course of construction, at a cost of £460 000 or Of this it is expected that £180 000 will be spent during the next four years for the building of 100 kilometres (62.5 miles) of road.

Agricultural improvements. — Of the 500 000 acres which constitute the whole Roman Campagna, 175 000 acres have been subjected to compulsory improvement, of which 112 000 acres excluding the suburbs make up the zone fixed by the law of 1903. Of this latter area, 6400 acres are already improved and 54 300 acres are in course of improvement, the remaining 51 000 acres being for the present almost untouched as the " Commissione di vigilanza per l'Agro Romano " admit the great difficulty of carrying the law into effect in all cases. Nothing has yet been done in those areas brought within the limits of the zone in 1910.

Loans. — The adjoining table shows the distribution of the annual grant of £80 000 from the central State bank for loans in connection with agricultural improvements; in ten years about £520 000 have been distributed.

	1907-08	1908-09	1909-10	1910-11	1911-12	1912-13	1913-14 (1st half year)	Total for the period	
	lire	lire	lire	lire	lire	lire	lire	lire	
New cottages	292 166	791 725	1 345 376	512 884	881 000	107 804	60 209	3 991 164	(£159 646)
Old cottages repaired	15 373	138 080	187 200	248 217	94 140	159 000	24 000	866 010	(£34 640)
Farm buildings	358 983	804 640	926 639	898 923	1 273 860	215 836	71 041	1 549 922	(£61 996)
Farm roads	77 230	124 100	358 930	185 020	246 019	39 050	11 350	1 041 699	(£47 668)
Land drainage	22 400	47 245	86 255	110 132	248 085	127 000	13 800	654 917	(£26 196)
Breaking up land	24 502	11 750	69 510	23 500	56 405	7 000	550	193 217	(£7 728)
Water supply	28 700	20 560	174 336	256 766	242 305	35 200	266 968	1 024 835	(£40 993)
Plantations	91 455	70 485	140 307	144 803	93 820	8 130	—	549 000	(£21 960)
Other operations	52 441	49 250	44 847	117 055	90 760	17 765	16 651	388 769	(£15 550)
Total each year	963 250	2 057 735	3 333 400	2 497 300	3 226 394	716 785	464 569		
	(£38 550)	(£82 313)	(£133 336)	(£99 892)	(£129 035)	(£28 671)	(£18 582)		

774 – **Bookkeeping Results: Five-Year Averages obtained at the Accountants' Office of the German Agricultural Society.** — STIEGER. — *Arbeiten der Deutschen Landwirtschafts-Gesellschaft*, Part 255, pp. 87 + 4 tables. Berlin, 1914.

Two years ago Part 180 of the *Arbeiten der D. L. G.* gave the principal average results of five years of bookkeeping in the farms affiliated to the accountants' office of the German Agricultural Society (D. L. G.); these averages are now published annually.

The present work contains the average results of the books kept in 114 farms, classed according to the different regions of the country, for the years 1907-08 to 1911-12. In order to compare these data with each other and to exclude those of the abnormal year 1911-12, the writer adds the averages of the five years 1906-07 to 1910-11 for 103 farms which bear the same numbers in both synopses.

These data are given in the form of tables which contain 71 columns as follows:

Column 1: number given to each farm (repeated in column 71).

Column 2: group to which the farm belonged according to its extent.

Column 3: distance of the farm from the nearest railway station.

Column 4: net returns as ascertained for the purposes of the land tax, given as indications of the quality of the soil.

Column 5: total value of the farm, which in 48 cases is the value of the farm as established in order to fix the amount of the complementary taxes, in 10 cases the net returns as per land register multiplied by 25, in 14 cases the real purchase price, in 2 cases the value estimated by the "Landschaft" (a Prussian credit institution), in 9 cases the rent capitalized at 3 per cent. plus the value of the live and dead stock, and in 27 cases the value as estimated by the owner himself.

Column 6: capital invested in buildings
Column 7: capital in machinery and implements
Column 8: live stock
} According to inventory

Column 9: total live and dead stock in percentage of the whole value of the farm.

Column 10: total live stock in head of large cattle per 100 hectares (247 acres) of cultivable area.

Column 11: total draught animals in horse units.

Column 12: number of draught animals per 100 hectares (247 acres) of cultivable area.

Columns 13 to 20: the various crops (13, meadows; 14, permanent pastures, both in percentages of the whole cultivable area; 15, winter cereals; 16, spring cereals; 17, pulse crops; 18, hoed crops; 19, forage crops; 20, bare fallow, (all in percentages of the arable land).

Columns 21-26: yields in weight of the six most important crops (wheat, rye, barley, oats, sugar-beets, potatoes).

Column 27: average milk yield per cow and per ration-day.

Column 28: sale price of the milk.

Column 29: total yield of the farm; that is, besides the returns from the sale for cash or credit of the produce, also the value of those articles

pplied to the owner and the increase in value of the inventory at the
d of the year.

Column 30: total outlay; that is the total working expenses
ges, insurance, outlay other than in cash, such as wear and tear and de-
ciation of farm implements and other capital, and the decrease in
lue of the inventory at the end of the year as compared with that at
e beginning.

Column 31 shows the difference between the items in columns 29
d 30, which represents the net returns of the farm free from debts, rent
other charges. The net returns per unit of area afford a clear expression
the absolute result of the farm; but if this is to be estimated at its just
d full value, it must be examined in connection with other data concern-
g the same farm. Thus, for instance, the best net return is that obtained
th the least expense in the course of the year.

Column 32: shows the amount of expense per unit of net returns. In
mparing the results of several farms this figure is not sufficient measure
the success of the farm because it does not take into consideration
e value of the farm, and of two farms which, with the same yearly outlay,
t the same net returns, the one with the least capital value is to be
nsidered the better managed of the two.

Column 33 shows the net returns expressed as percentage of the
lue of the farm, that is the interest on the total capital. This figure does
t consider the year's expenses, and it is evident that of two farms the
t returns of which give the same amount of interest on the total capital,
e more successful one is that which obtains this result with the least
pense. It thus becomes necessary to take into account the year's
penses as well as the interest on the value of the farm. The easiest
y to do so is to add these two quantities together in order to get the
tal expenses and to obtain the ratio of the net returns to this sum.

Column 34 shows the actual amount of the 4 per cent. interest
unit of surface; then, after having added together, for each farm, the
res contained in columns 30 and 34 in order to have the total amount
xpenses, all that remains to be done is to divide by this number the net
rns multiplied by one hundred, in order to get the desired number which
ws the amount of net returns obtained per cent of total expenses.
s figure is found in Column 35.

Column 35: this figure affords the best possible base for judging
quality of the management of a farm from the point of view of profit-
ness. The writer calls it the "fundamental number" (Kernzahl).

Columns 36-41: amounts of the chief partial receipts in cash.

Column 42: total amount of cash receipts.

Columns 49-60: these give the farm expenses (60, the total a-
nt, 49-59 the principal partial amounts).

In Columns 43-48 and 61-70 the quantities contained in columns 36-41
49-59 are repeated, but expressed respectively in percentages of the
l amount of receipts and in percentages of the total amount of expenses.

The writer gives the averages of the interest obtained by these farms

during the years 1907-8 to 1911-12, first all together and then grouped according to provinces. He then endeavours to determine the influence of the quality of the soil, represented by the amount of the net returns according to the land register, on the economic results of 18 farms in the province of Silesia, and of 21 in the province of Brandeburg. The farms are arranged according to the land register net returns and the writer indicates for each farm: the yield of the crops per unit area, the net returns, the fundamental number (Kernzahl), the outlay for the purchase of artificial manures, the receipts from productive live stock, and the ratio between the areas under the various crops. If for the 21 Brandeburg farms, the first half with average land register net returns of 6*s* 3*d* per acre be compared with the other half with average land register net returns of 3*s* 5*d* per acre, higher effective net returns will be obtained for the first group than for the second (£ 1 0*s* 5*d* against 11*s* 5*d*), although the returns from the various farms taken separately differ considerably. The same result is obtained with the Silesian farms, the two groups of which show respectively land register net returns of 10*s* 7*d* and 4*s* 2*d*, and effective net returns of £ 1 9*s* 11*d* and 10*s* 10*d* per acre. In the same way the fundamental number of the Silesian farms, which is for the two groups 24.80 and 11.56, shows that the better quality of soil allows results to be obtained more economically. The difference between these two numbers is considerably less in Brandeburg (15.21 and 12.24).

At the end of his work, the writer calls attentions to the great importance of the value of the farm for all discussions on the management and organization on numerical bases, and on the necessity of a clear understanding as to this value and to the exact method of determining it.

AGRICULTURAL INDUSTRIES.

775 – **The Electric Field in the Maturation of Wine.** — NITESCU, MARCEL J *Revue de Viticulture*, Year XXI, No. 1068, pp. 621-624. Paris, June 4, 1914.

Wine is a good electrical conductor because of the acids and salts it contains, and it has been subjected to the influence of an electric field by CH. HENRY in order to bring about sterilization and maturation. The electric field employed is continuous and of high tension (100 000 volts) but of low intensity, so that the wine should be decomposed as little as possible, though suspended matter and colloids are sufficiently electrified to move towards one of the poles, where they can easily be eliminated. At the same time the invertion of sugar is prevented, and it is thus possible to treat wines attacked by injurious ferments such as "graisse" or "casse".

The Henry method makes it possible to control the process by stopping it as soon as the samples drawn from taps close to the poles have the same flavour as those drawn from the bung hole. The movement of the colloids in the liquid has the further function of constantly stirring the layer of reaction surface presented by them and thus accelerating their catalysis action.

The different wines, brandies and kirschs which have been treated, ıld, besides an appreciable increase of volatile esthers, the various ma- ration indices which are usually observed as the result of the action of e more slowly working enzymes.

6 - **The Alcohol Content of Yeast.** — FOTH, G. in *Jahrbuch des Vereins der Spiritus-fabrikanten in Deutschland*, Vol. XIV, p. 33. Berlin, 1914.

A series of determinations was carried out in the Laboratory of the ɔciety of German Distillers in order to investigate the alcohol content yeast under various conditions. The results are as follows :

1) The alcohol produced by the fermentation of sugar solutions is ɔt all found in the solution; part is retained by the yeast. Moreover ıe amount of alcohol in both yeast and solution, stated as per cent. of al- ɔhol + water in both cases, is practically the same and this fact holds ɔod in both weak and strong sugar solutions (10 to 20 per cent.).

2) If yeast be washed to remove the alcohol it contains and then into a solution containing alcohol, it will absorb alcohol until equili- ım is established between the yeast and the solution.

3) If yeast be left in alcohol solution, the alcohol content of both st and solution diminishes owing to assimilation of part of the alcohol.

4) The content of compressed yeast in both water and alcohol in- ases with the time of keeping, while glycogen disappears simultaneously, m which it would appear that the increase in water and alcohol is due to decomposition of the glycogen. Moreover the amount of alcohol thus med is considerably less than the amount expected by the fermentation ıation.

- **The Use of "Phosphogelose" in Brazil.** — PELLET, H. in *Bulletin de l'Association des chimistes de sucrerie et de distillerie*, Vol. XXXI, No. 11, pp. 849-858. Paris, May 1914.

The "phosphogelose" process in the manufacture of sugar consists the addition of a mixture of bicalcic phosphate and kieselguhr to the ce previously treated with lime, the object being to help clarification d to obtain a scum of manurial value. The composition of two such ıms was as follows :

	Per cent.
Water	43.56 to 43.23
Organic matter	26.32 to 27.67
Total phosphoric acid	8.41 to 9.85

The process is at present in use in a few sugar factories in Bahia.

8 - **The Reduced Gluten Content of Flour.** — BALLAND, J. A. F., in *Comptes rendus des séances de l'Académie des Sciences*, Vol. 158, No. 16, pp. 1103-1106. Paris, April 20, 1914.

For some time the Paris bakers have complained that flour requires s water than it did formerly to work up into dough. Analyses from e laboratory of the Bakers' Syndicate show that more than half of the urs examined during the month of February, 1914, contained less than

7.5 per cent. of dry gluten or 22.5 per cent. of moist gluten, a quantity which is considered insufficient to obtain the best results in breadmaking and which is generally attributed to degeneracy of the wheat owing to intensive culture.

From 1869 to 1880 the mean annual content of moist gluten in high class flours from twelve milling firms varied from 27.53 to 30.34, with an average of 29.1 per cent., or 9.7 per cent. of dry gluten. From 1881 to 1895 the figures range from 23.44 to 26.84, with an average of 25.1; during the last ten years (1905-1914) they were further reduced to 21.1, 26.8 and 24.7 respectively. Inferior quality flours frequently only contain 7.5 per cent. of dry gluten.

Although these data are not absolutely comparable owing to the introduction of foreign wheat, they would indicate that since roller mills have supplanted the grist mills, flour has reduced its dry gluten content by 2 per cent., that is, every kilog. of flour has lost 22 gms. of protein, which is equivalent to the amount contained in 110 gms. of butcher's meat. On examining the seasonal and regional yield, it was concluded that this loss of gluten is not due solely to degeneration of the wheat, but also to climatic variations and to the new methods of milling which eliminate the germ and those portions of the wheat grain which contain most nitrogen.

779 – **International Union of Municipal Dairies.** — *Molkerei Zeitung*, Ver[illegible]: No. 49, pp. 944-945. Hildesheim, June 26, 1914.

On the occasion of the Sixth International Dairy Congress, at Bern was held the first general meeting of the recently founded International Union of Municipal Dairies, a large number of municipal dairy enterprises bring represented. Stockholm was selected by the meeting as the head quarters of the Union, which has for its object the general advancement of municipal dairying and the advising of its members as to methods of improving their business.

780 – **The Supply of Milk to Indian Cities.** — MANN. H. H. (Agricultural College Poona) in *The Agricultural Journal of India*, Vol. IX, Part 2, pp. 160-177. Calcutta April 1914.

An account is given of the milk supply of Poona, this being fairly representative of the conditions existing in several other Indian cities. The milk is produced partly in the city itself and partly in 47 neighbouring villages which send in about 550 galls. per day; of this :

21	per cent.	comes from villages	within a radius of less	than 3 miles
48	»	»	»	3 to 6 »
28.5	»	»	»	6 to 9 »
2.5	»	»	»	over 9 »

Practically the whole supply is brought in by hand in brass pots slung over the shoulders or carried on the heads of the milkmen, bullock carts the train being only used in a few cases. Nine-tenths of the total consist of buffaloes' milk, whose content of fat and solids-non-fat amounts to 5 a 9 per cent. respectively, as against 3 ½ and 8 ½ per cent. in cows' mi

51 samples collected at the entrance of the city only 10 were pure, hen judged on a very conservative basis, the remainder being adul- l with more than ten per cent. of water. The price varies with the , there being a close connection between the price and the amount of added; for instance all milk sold at less than six seers for one rupee per gallon) is almost certain to be adulterated. With regard to nount of dirt it contains, this is not nearly so great as would be ed; of the 51 above samples:

56.7	per cent. were	clean or nearly clean
33.3	»	fairly clean
7.8	»	distinctly dirty
1.9	»	very dirty

he milk produced in the city itself is a far more important con- on to the total supplies than that brought in from the sur- ng country. The milking cattle of the city consist of 2 688 head, ich 1532, or 57 per cent., are kept for private use only and 1156, per cent., for sale of the milk. Among the former class about three- rs consist of cows and the remainder of buffaloes, while in the latter he proportions are reversed. The cattle kept for the sale of their milk used in small sheds distributed all over the city; 80 per cent. of these contain less than ten animals, and their general conditions of ie are very bad. It is estimated that about 2 000 gallons are pro- daily, of which about 1 400 gallons are buffaloes' milk and the rest milk; the total daily consumption in the city therefore amounts to gallons per day.

he writer discusses schemes of reform for the city milk supplies and ates the establishment of large dairy farms outside the city, where imals would be in cheap and natural surro..ndings, and the organisa- of village production and export.

Experiments with the Biorisator (1). — WEIGMANN, in *Molkerei Zeitung*, Year 28, o. 46, pp. 885-886; No. 47, pp. 899-901. Hildesheim, June 17 and 19, 1914.

he experiments made by passing several hundred gallons of milk gh a Biorisator capable of dealing with 55 galls. of milk per hour have med in the main the conclusions arrived at in former tests. They further that cheeses made with biorized milk are richer in water and t than cheeses made at the same time with exactly the same quantity w milk. Biorized milk kept good 2 ½ days, while raw milk turned one day.

Altogether the writer is of opinion that the process is useful, but he nm. nds that care be taken to prevent new infection of the biorized

(1) See also No. 743, *B.* June 1913; No. 1190, *B.* Oct. 1913; No. 1389, *B.* Dec. 1913 o, *B.* June 1914. (*Ed.*).

782 – **The Action of the Enzymes due to Organisms on the Rind of Hard C**
— GRATZ, O. and SZANYI, ST. in *Biochemische Zeitschrift*, Vol. 63, Parts 4, 5
pp. 436-478. Berlin, June 6, 1914.

Careful examination of the various layers of cheese, starting from outside and proceeding inwards, leads to the conclusion that in Tra and Ovar cheeses the enzymes of the flora of the rind have no action on decomposition of casein and fat in the inside of the cheeses. Furthe theoretical grounds, the possibility of the diffusion of the enzymes fr the rind towards the interior must be rejected.

783 – **The Preparation of Buffalo Skins for Export from the French Colon**
BOULANGER, H. in *Bulletin de l'Office coloniale du Ministère des Colonies*, Year
No. 75, pp. 131-144. Melun, March 1914.

It is pointed out that the buffalo skins arriving on the European mark from the French colonies are frequently in a very unsatisfactory condi owing to faulty methods of preparation, and compare unfavourably w similar products from the Dutch Indies, Burma, India and Egypt; cer reforms are advocated.

784 – **Agricultural Storehouses in Bavaria (Financial Year 1912-13).** – *Lan schaftliches Jahrbuch für Bayern*, Year 4, No. 4, pp. 365-415. Munich, 1914.

The number of agricultural storehouses in Bavaria, in the year 191 was 177, against 169 in the preceding year. The total cost of buil and arranging them was in round numbers £193 000. The cereals deliv to the stores amounted to 119 920 tons and those sold to 115 560 tons 1900-01 the corresponding figures were 29 728 and 28 522 tons.

Out of these 177 storehouses only 35 are for the exclusive service o members of the associations that work the storehouse, while the remai 142 can be used by non-members also. In 135 stores the cereals mu bought at fixed prices, and 23 advance money on cereals. The am of the loan varies from 33⅓ to 95 per cent. of the sale price. Some st besides purchasing at fixed prices, act as brokers for the sale of ce while 23 do not trade at all in cereals. In 32 of these storehouses, st dues are levied; these range from 2½*d* to 10*s* per ton. For cle and grading the grain 83 stores have a scale of charges somewhat l for non-members than for members. The dues vary from 1*s* to 12 ton. Fifty stores grind cereals, at charges ranging from 2*s* to 20*s* pe

Of the 177 storehouses, 93 are managed by loan banks, 40 by house cooperatives and by purchase and sale associations, 27 by in federations of associations, 10 by agricultural district associations, 4 private enterprize and one each by a peasants' association and by a fr growers' association.

Besides dealing with the sale of agricultural produce, these st houses purchase agricultural machines and implements, concentrated fo seeds, coals and the like.

Eighty-nine of these stores showed a profit at the end of the year 54 a loss. In the preceding year the figures were respectively 130 an

In 1913 the State granted subventions amounting to £206, and l bearing 2 per cent interest amounting to £956.

PLANT DISEASES.

DISEASES NOT DUE TO PARASITES AND OF UNKNOWN ORIGIN.

Leaf-Spot Disease of Sisal in German East Africa. — BRAUN, K. in *Der Pflanzer*, Year X, Part 4, pp. 188-197, plate III. Daressalam, April 1914.

In 1913 leaves of Sisal were found to be more severely attacked than by a leaf-spot disease; the spots were sunken and parti-coloured or ; at the time of utilizing the leaves, these spots formed dark masses difficulty separated from the fibres.

Experiments on the cause of this disease have shown that it may be ced by high temperatures. A temperature of 41° C. for 10 minutes ave a decidedly injurious action, and such temperatures frequently in the hot steppes. It is not yet known whether the susceptibility reased by other factors unfavourable to the plant.

Researches on Gummosis and the Effects of Frost on Cherry Trees. — RAUER, P. in *Landwirtschaftliche Jahrbücher*, Vol. XLVI, Part 2, pp. 253-273 + plates. Berlin, April 6, 1914.

In continuation of previous experiments and researches the writer o barked a few ungrafted sweet cherry trees (*Prunus avium*) about 30 years old. On some of the trunks the bark was removed all round, hers only on one side for a length of about 3 feet; in all of them the sap- was reached. The object of this was to determine whether the irri- caused by the wound was alone the cause of gummosis as is currently ed.

The experiments have proved that the irritation theory, according hich only wounds cause gummosis, is not correct in this form. A d can certainly produce gummosis, but many wounds are not accomp- by gummosis. On the other hand this disease appears also on spots have not been in any way wounded.

In the above experiments no centres of gummosis appeared in the d-callus in the bark. On the other hand such centres appeared tissues (and precisely in the recently formed wood) of those portions

of the trunk which were not injured and which were formed, at the time as the callus tissues, under the old bark. These diseased sp the wood of recent formation and still in a parenchymatous state larger as the distance from the wound increases, but only up to a c limit, beyond which none are found. In the older annual rings forme fore the callus, the disease does not appear at all. The irritation c by the wound may be considered the sole cause of this.

The wound, according to the writer's observation, causes a con able afflux of protoplasmic matter towards the tissues that it has laid and to the neighbouring parts, which thus acquire the character of y growth necessary for the formation of callus tissue. This flow of p plasm leads, however, at the same time to an accumulation of the enz present in all young tissues ; of these, the cytases appear first, whil coagulases increase only gradually.

If these enzymes find their natural employment, as is the case in c young normally growing part of a plant, in which there is a suffic formation of new cells, no anomalies are caused, and consequently gummosis spots are produced on the new bark that is formed. In adjoining parts of the trunk, which have not been deprived of their bark; where the normal pressure of the latter hinders the increase of new c an unfavourable ratio is established between the afflux of enzymes and th utilization in the formation of new tissue. The consequent excess cytases causes outbreaks of gummosis. Near the wound these outbre are smaller, because the formation of wood and of new cells increa and the enzymes are utilized to a greater extent. At a certain dista from the wound these effects cease, because the irritation due to the wo is no longer felt. A wound thus causes gummosis only when an un vourable ratio is set up between the quantities of enzymes flowing towa it and their utilization, thus causing an excess of cytases. This excess dissolving enzymes prevents the formation of normal cell walls in t cambium tissues, or redissolves those already formed in the ol tissues; in this case the cytases proceeding from the inside of the towards the outside cause the dissolution of the secondary membr and the result is gummosis.

This unfavourable ratio between the hydrolizing and coagul enzymes appears not only in cases of traumatic origin but often i injured tissues. Thus the writer was able to prove the presence of gum in the vegetative cone of completely sound twigs. The contours of wo are the spots on which these ruptures of enzyme equlibrium more frequ ly occur. It is not the wound in itself that determines gummosis.

BACTERIAL AND FUNGOID DISEASES.

787 – **New Fungi.** — Sydow, H. and P., in *Annales Mycologici*, Vol. XII, No. 2, pp. 19 Berlin, 1914.

This (twelfth) report gives descriptions of one genus and 32 spe of fungi new to Science, collected at various times and in various countr

They include the following: *Hemileia Holarrhenae* on leaves of *Holarrhena antidysenterica* in Eastern India; *Aecidium parile* on leaves of *Canthus* sp., which is itself parasitic on *Goniothalamus Elmeri*, in the Philippines; *Entyloma Oryzae* on rice leaves in the Philippines; *Meliola Memecyli* on leaves of *Memecylon edule* in Eastern India; *Cercospora Artocarpi* on leaves of *Artocarpus indica* in the Philippines; *C. Canavaliae* on leaves of *Canavalia ensiformis* in the Philippines; *C. pachyderma* on leaves of *Dioscorea alata* in the Philippines; *C. Puerariae* on leaves of *Pueraria phaseoloides* in the Philippines.

— **Contribution to the Mycological Flora of the Tyrol and Istria.** — BUBÁK, FR. in *Annales Mycologici*, Vol. XII, No. 2, pp. 205-220, plate VIII. Berlin, 1914.

Among fungi collected in the Tyrol and Istria in 1912 and 1913, the following occurrences are noteworthy:

Melampsora Lini (D. C.) Tul., which produces rust of cultivated flax, on *Linum angustifolium* in Istria.

Rehmiellopsis conigena Bubák (new) on the apophyses of the cones of *Pinus halepensis* and *P. Pinea* in the Tyrol.

Ceuthospora phacidioides (Grev.) var. *Oleae* Scalia in olive groves in Tyrol.

Cycloconium oleaginum Cast., so far only known from olive (on which it produces the leaf-spot disease known in Italy as "olive pox" or "peacock's-eye"), has now been found in the Tyrol on *Phillyrea latifolia* (Oleaceae).

Cladosporium episclerotiale Bubák (new) on sclerotia of *Sclerotinia cerea* Schröt. (producing brown-rot of stone fruits) from mummified plums, in the Tyrol.

— **Parasitic Fungi from Northern Japan** (1). — SYDOW, H. and P., in *Annales Mycologici*, Vol. XII, No. 2, pp. 158-165, 1 fig. Berlin, 1914.

This second contribution to the parasitic fungus-flora of Northern Japan includes 55 species, *viz.* Uredineae, 33; Ustilagineae, 1; Phycomycetes, 2; Ascomycetes, 7; Fungi Imperfecti, 12. Most of these were collected in 1913; one genus and eight species are new.

The following are of special interest:

Puccinia triticina Eriks. on *Triticum vulgare* L.

Uropyxis Fraxini (Kom.) P. Magn., on *Fraxinus longicuspis* Sieb. Zucc., new for Japan.

Gymnosporangium Yamadae Miyabe: aecidia on leaves of *Pyrus Malus* L., teleutospores on branches of *Juniperus chinensis* L. (2).

Phytophthora infestans (Mont.) De Bary, on *Solanum Melongena* L.

Mycosphaerella Yamadai Syd. (considered by Salmon as a variety of *M. Alni*), on leaves of *Hovenia dulcis* Thunb.

Cystotheca lanestris (Harkn.) Sacc., on *Quercus glandulifera* Bl.

(1) See also No. 608, *B.* Feb. 1911: No. 994, *B.* March 1911; No. 1529, *B.* May 1911. (*Ed.*).

(2) See No. 481, *B.* May 1914 and No. 578, *B.* June 1914. (*Ed.*).

Discosia maculiformis Syd. (new), on living leaves of *Fagus sylvatica* L. var. *Sieboldi* Maxim.

Clasterosporium degenerans Syd. (new), on living leaves of *Prunus Mume* Sieb. et Zucc. (1).

790 – **Parasitic Fungi from Formosa.** — SYDOW, H. and P., in *Annales Mycologici* Vol. XII, No. 2, pp. 105-112. Berlin, 1914.

The fungus flora of Formosa was previously quite unknown. The writers now record 50 parasitic fungi collected there between 1905 and 1914; they include: Uredineae, 44 (13 new); Phycomycetes, 1; Ascomycetes, 2; Deuteromycetes, 3 (2 new).

The following species occurring on cultivated plants may be mentioned:

Kuehneola Fici (Cast.) Butl., on leaves of fig (*Ficus Carica* L.), *Broussonetia papyrifera* (L.) Vent. and white mulberry (*Morus alba* L.).

Ochropsora Sorbi Diet., on leaves of *Pyrus sinensis* Lindl.

Phleospora Mori (Lév.) Sacc., on leaves of *Morus alba*.

791 – **Resistance of Potatoes to Blight (*Phytophthora infestans*) in New Zealand.** — HILL, W. S., in *The Journal of Agriculture*, Vol. VIII, No. 4, pp. 367-371, 1 fig. Wellington, N. Z., 1914.

At the experimental farm at Moumahaki it has been observed that the potato Gamekeeper is very resistant to the disease (*Phytophthora infestans*), while Up-to-date growing beside it suffers severely. The form seems to be well adapted to the light soil and damp climate of the locality.

792 – **Commercial Sulphate of Copper and the Determination of the Copper in it.** — MACH, F. and LEDERLE, P. in *Die landwirtschaftlichen Versuchs-Stationen* Vol. LXXXIV, Part 1-2, pp. 129-143. Berlin, April 14, 1914.

The writers examined five samples of sulphate of copper (one from Switzerland, two from Germany, one from Belgium and one from England) at the Agricultural Experiment Station of Augustenberg, Baden; they observed a difference in the behaviour of the samples when crystals of equal weight were dissolved in distilled water at room temperature. The crystals of two samples took 90 minutes to dissolve, two others 120 minutes and one 85. When these crystals were ground, no difference in the time required for their solution was observed. In the preparation of Bordeaux mixtures with these solutions, after standing one hour some differences were noticed, which on standing longer almost completely disappeared. On adding to 100 gallons of these mixtures 1 lb. of sugar they all behaved completely alike, precipitating but little and showing also after standing a length of time the same slimy consistence. The writers come to the conclusion that as far as their practical use is concerned the samples examined all have the same value.

As large well coloured crystals cannot, without further examination, be considered pure (they may, for instance, contain sulphate of manganese) the writers consider a qualitative analysis to be indispensable.

For the determination of the copper content they adopted R. W

(1) See No. 581, *B.* March 1912.

h's method with sodium hypophosphite, and the method proposed Rhead and recommended by Moser with titanium trichloride. The first hod almost always gave somewhat too low values; it is suitable only re the saving of time is a consideration, while the titanium trichloride hod gives very reliable values.

– Comparative Spraying Experiments with Several Fungicides against Vine Mildew. — BRETSCHNEIDER, A. in *Zeitschrift für das landwirtschaftliche Versuchswesen in Oesterreich*, Year XVII, Part 3-4, pp. 106-118. Vienna, March-April 1914.

In 1913 experiments on the control of vine mildew (*Plasmopara viti-*) were made in various parts of Austria, Bordeaux mixture being ıpared with the following commercial fungicides: " Antiperonospora " er cent.), " Cupran " (1, 2 and 3 per cent.), " Cuprosulfid " (½, 1 and 2 cent.), " Forhin " (1 and 2 per cent.), " Kupferchlorid " (1, 2 and 3 cent., apparently identical with the " Pasta Caffaro " long used with ess in Italy) ", " Perocid " (" Cerdidyum sulfat ", 1, 2 and 3 per cent,), lime-sulphur wash (1 : 30 and 1 : 40).

These fungicides have also been tried in some places against mildew ucurbitaceae (*Pseudoperonospora cubensis*) and certain fungi affecting t trees (*Fusicladium, Monilia, Sphaerotheca*, etc.).

The adhesiveness of the various mixtures was generally good; as ıe visibility of the sprayed foliage, it was best with " Perocid " and eaux mixture and sufficiently good with the other mixtures, with the ıtion of " Cupran ". For rapidity of preparation, all the fungicides, the exception of copper sulphate and " Perocid ", dissolve rapidly. ıran " and " Kupferchlorid " dissolve without leaving any residue, hin " leaves a little and " Antiperonospora " rather more. " Cupro- " settles very rapidly. " Cupran ", " Knpferchlorid " and " Perocid " a neutral reaction, " Cuprosulfid " and " Antiperonospora " have a tly acid one, and " Forhin " is very acid. With the exception of ıran " and " Antiperonospora " none of the mixtures clog the sprayers. prosulfid " and " Antiperonospora " cause considerable scorching e foliage, " Cupran " and " Forhin " (one case) also, but in a lesser ıe. The other fungicides, including the two sulphur preparations, harmless.

As regards the fungicidal power of the several preparations, the writer ves that the results of the experiments have only a relative value, use in 1913 only few localities were visited by a severe attack of mil- In the scale of efficiency the first place is held by Bordeaux mixture; in order of merit are: " Forhin " (which proved very good), " Perocid " iently effective in 3 per cent. solution), "Kupferchlorid " (effective must be applied in 3 per cent. solution); then " Antiperonospora " h did not completely prevent the appearance of mildew) and last " Cupran " and " Cuprosulfid ", which failed completely. It was ossible to judge the effect of the lime-sulphur wash, because where tried mildew had scarcely shown itself.

Against *Pseudoperonospora cubensis* all the fungicides that were tested unavailing.

The effect of the above fungicides in the control of the fungi of fruit trees could not be ascertained; further experiments are necessary. "Antipero nospora", "Cuprosulfid" and "Cupran" are not be taken into consider ation, as they cause scorching even on apple trees.

The fungicides which deserve being considered in practical work in the control of mildew are: "Forhin" (which must be placed on the market with a more constant composition), "Kupferchlorid" (which is now sold in the form of paste, like the "Pasta Caffaro," because under the form of powder it has not been satisfactory), and "Perocid". The latter espe cially seems to have a future before it, because it costs much less than Bordeaux mixture; the other two fungicides cost about the same and ap proach more the price of Bordeaux mixture.

794 – **The Control of Damping-off Disease in Plant Beds.** — JOHNSON, JAMES, in *Agricultural Experiment Station of the University of Wisconsin, Research Bulletin* 31, pp. 29-61, figs. 1-12. Madison, Wis., March 1914.

Damping-off of tobacco seedlings in Wisconsin is generally produced by either *Pythium De Baryanum* Hesse or some species of *Rhizoctonia*. These two fungi can live on a great variety of hosts, as well as on organic matter in the soil.

The special points in the control of damping-off requiring further study were: 1) the strength of formalin sufficient to give complete control 2) the relative value of other fungicides; 3) the value and practicability of steam sterilization of soils in the field.

In studying these points, tobacco and cress (*Lepidium sativum*) were grown in boxes in untreated soil, in sterilized soil inoculated with the organisms and in uninoculated sterilized soil, the various treatments being applied to the re-inoculated soils.

It was found that 1-100 formalin did not kill the fungus, though it kept it in check for some time. Treating the soil with 1-50 formalin at the rate of two quarts per square foot of soil, will kill the fungi which cause damping-off, and hence will prevent the outbreak of the disease even under the weather conditions most favourable for its appearance. Formalin treatment has the further advantages of exerting a slight stimulating action on plant growth and of killing some weed seeds; but the formalin costs a good deal and takes some time to act, while the soil dries out slowly after treatment.

Sterilization of the soil by heat has proved the most satisfactory method of preventing damping-off from all standpoints, except that under certain conditions it may be more expensive than formalin treatment. Where a steam traction-engine can be obtained, the sterilization is best performed by introducing steam under pressure from the engine below a galvanized iron pan inverted over the seedbed; the edges of the pan should be driven into the soil an inch or so, and the steam applied for half an hour or an hour. Sterilization by heat has the further advantage of killing all weed seeds and insect pests, and of giving greatly increased vigour and growth of the plants sown afterwards.

)5 – **The 1914 Outbreak of Rust on Winter Grain in Bavaria.** — HILTNER, L. in *Wochenblatt des Landwirtschaftlichen Vereins in Bayern*, 1914, No. 25.

In many parts of Bavaria rust on wheat and rye was so abundant the summer as to cause general alarm. The attacks are almost all ıe to *Puccinia glumarum*, *P. triticina* being only occasionally associated th it.

As the ears were particularly badly attacked, total losses of crop were ared by the farmers; but the writer points out that the experience of)04 and 1911 shows that even a bad attack of yellow rust in the ears may sult in nothing worse than some diminution of yield.

In previous outbreaks the following points were observed. In wheat, e local varieties are particularly subject to severe attacks of yellow st (*P. glumarum*), whilst most other varieties, in particular the pedigree ies, remain nearly free. Many of the latter were, however, attacked ; black rust (*P. triticina*), from about the middle of June, but without ıch damage being done. Yellow rust, which is often called spring rust, ay appear as early as the end of April, as it did this year. In rye no arked distinctions between varieties as to rust-resistance have been)served.

There is a general consensus of opinion that rust is much favoured by ıe-sided nitrogenous manuring, especially with nitrate of soda; this)servation was, however, made before much care was taken to distinguish ıe different kinds of rust. In 1904 and this year (1914) it was found that ellow rust was less severe on fields properly manured, even when the dress- g included sulphate of ammonia or nitrate, than on unmanured land; lso that thin crops were far more severely attacked than an even crop ering the ground properly. Unbalanced nitrogenous manuring is, vever, favourable to yellow rust also, while dressings of phosphates ve a marked effect in preventing rust; cereals following a green manure p are also very little subject to rust.

The true cause of severe outbreaks of rust is certainly the state of the ather. This year, just as in 1904, the outbreak was induced by the t that in April a number of hot days were followed by frosts or heavy ıs: then a spell of cool weather checked the growth of the crops, so king them very susceptible. The local varieties, which grow very ickly in spring, were the most severely attacked. Mists seem also y favourable to the spread of rust. The first reports of rust came from same place each year, no doubt showing that the conditions there were table for an early outbreak, and confirming the importance of atmo- neric conditions.

The writer suggests the advisability of making a comparative enquiry roughout Europe on the appearance of rust in its connection with varieties, l, weather, etc., with a view to finding out the conditions leading to demics of this disease.

796 – **A Fungus Disease of Peppers (*Capsicum* spp.) : *Colletotrichum nigrum*.** — BANCROFT, C. K. in *The Journal of the Board of Agriculture in British Guiana*, Vol. VII, No. 3, pp. 139-140. Demerara, 1914.

In 1913 the fruits of various peppers (*Capsicum*) in the experimental area of the Botanic Garden at Georgetown were attacked by a disease which spread so fast that some plants lost all their crop. The disease appears first in the form of spots at the apex or on the sides of the fruit ; these generally form when the fruit is half-grown. Concentric circles then form round the point of infection, and eventually the whole fruit may become involved, or may fall off. On the affected parts the fruit bodies of a fungus have been found : this has been identified as *Colletotrichum nigrum* Ellis et Halsted.

The fungus appears also to make its way down the stems for some distance.

Some varieties of pepper, such as Long White and Long Red, seem to be very subject to the disease, while others are less attacked ; Red Chilly and Long Bird seem to be quite immune.

The treatment adopted was to cut back the infected plants and spray with Bordeaux mixture : after the last spraying few fruits were attacked.

INSECT PESTS.

797 – **The Scale Insects of British Guiana.** — BODKIN, G. E., in *The Journal of the Board of Agriculture of British Guiana*, Vol. VII, No. 3, pp. 106-124. Demerara, 1914.

In British Guiana scale insects are the worst enemies of cultivated plants ; in general they are known as " blight ".

The following species, being widely distributed and attacking a great number of cultivated plants, are to be considered as highly injurious : *Aspidiotus destructor*, *Lepidosaphes beckii*, *Ischnaspis longirostris*, *Pseudococcus citri* and *Saissetia nigra*.

A number of species attack ornamental plants (in particular orchids and ferns) in sheltered places ; others, again, are constantly associated with certain crops, as *Aulacaspis rosæ* on mango and *Ripersia* sp. on sugarcane.

Many species are undoubtedly indigenous, while others have been introduced, especially from the West Indies, with fruits and provisions. A notable absence is that of *Diaspis* (*Aulacaspis*) *pentagona*, which is common throughout the West Indies. Certain well-known species, such as *Aspidiotus destructor* and *Vinsonia stellifera*, occur on trees and orchids in the virgin forests of the interior, while the most isolated native plantations are always found to harbour scales.

A number of natural enemies are known in the Colony. Besides some undetermined Hymenoptera, they include : *Blastobasis lecaniella* Busck, *Vitula bodkini* Dyar and *V. toboga* Dyar, Lepidoptera whose larvae feed on *Saissetia nigra*, *S. oleae*. *S. hemisphaerica* and *Ceroplastes floridensis* ; *Cryptognatha nodiceps* Mshl., *Azia trinitatis* Mshl. and *A. pontibrian* Muls. (Coccinellidae), of which the first two attack *Aspidiotus destructor*

l the third *Saissetia hemisphaerica*; certain Neuroptera; and lastly two gi — *Sphaerostilbe coccophila* (red-headed fungus) attacking chiefly *ionaspis citri*, and *Cephalosporium Lecanii* (shield-scale fungus) attack- *Saissetia nigra*, *S. oleae*, *S. hemisphaerica*, *Coccus mangiferae* and *C. peridum*.

The following fifty-one species have so far been recorded from British iana :

ionaspis citri Comstock (orange snow-scale), common on the trunks and branches of *Citrus* trees and on castor-oil.

wardia biclavis Comstock, common on branches of jasmine (*Tabernaemontana Wallichiana*).

biclavis var. *detecta* Maskell, rare on branches of *Sapium Jenmanni*, a native rubber plant.

aspis boisduvalii Sign., frequent on shoots of plantains and on the orchid *Cattleya superba*.

echinocacti opuntiae Ckll., recorded in 1893 and 1899 on *Opuntia elongata*, but not observed since.

lacaspis rosae Bouché (mango snow-scale), common on leaves of mango and cinnamon.

michionaspis minor Mask., not uncommon on cotton.

inaspis buxi Bouché, common on leaves of ornamental palms and other plants.

pidiotus cydoniae Comstock, occasional on the stems of eggplants.

destructor Sign., abundant and injurious to coconut, banana, almond tree (*Terminalia Catappa*), avocado, etc.

diffinis Newstead, described from Demerara in 1893, but not found since in the Colony.

sacchari Ckll., sometimes common on sugarcane.

rganella longispina Morgan, described from Demerara in 1889, on *Cupania sapida*, but not found since.

naspidus articulatus Morgan (West Indian red scale), common on *Citrus* and leaves of Liberian coffee.

rysomphalus aonidum L. (red-spotted scale), frequent on leaves of *Citrus*.

aurantii Mask., rare on *Citrus*.

biformis Ckll., common on leaves of many orchids and on young sisal plants.

dictyospermi Morgan, described from Demerara in 1889, but not reported since.

dictyospermi var. *pinnulifera* Mask., recorded on crotons (*Cordiaeum*) at Demerara in 1893, but not found since.

dictyospermi var. *arecae* Newst., described from Demerara in 1893, but not found since.

personatus Comstock, common on leaves of star-apple (*Chrysophyllum Cainito*), ornamental palms and mangoes ; occasional on leaves of Para rubber (*Hevea brasilensis*).

pidosaphes beckii Newm. (orange mussel-scale), one of the commonest

in British Guiana, occurring on *Citrus*, *Codiaeum*, Barbados cherry (*Malpighia glabra*), etc.

L. pinnaeformis Bouché, recorded from Demerara in 1892, but not reported since.

Ischnaspis longirostris Sign., frequent on leaves of Liberian coffee, to which it is very injurious, and on ornamental palms.

Parlatoria zizyphus Lucas, occasional on leaves of *Citrus*.

Orthezia insignis Douglas, common and very injurious on various Compositae and *Citrus*.

O. praelonga Douglas (croton bug), fairly common on crotons (*Codiaeum* spp.), mango, Barbados cherry, sugarcane, *Sapium Jenmanni*, etc.

Asterolecanium bambusae Bdv., common on bamboos.

A. fimbriatum Fonsc., recorded from Demerara in 1889, but not found since.

A. pustulans Ckll., common on leaves of orchids and akee (*Blighia sapida*); occasionally damages Para rubber.

Lecaniodiaspis dendrobii Douglas, described from Demerara in 1892 on *Dendrobium* and *Codiaeum*, but not reported since.

Ceroputo barberi Ckll., reported on *Schinus terebinthifolius*.

Pseudococcus citri Risso (common mealy bug), very common on *Citrus*, cacao, ferns, *Codiaeum* and rice ; rare on sugarcane.

P. nipae Mask., occasional on coconut and other palms.

P. virgatus Ckll., occasional on egg-plant.

Ripersia sp. (sugarcane mealy bug), common on leaves of sugarcane.

Tachardia lacca Kerr. (the Indian scale producing lake), recorded in 1892 on *Erythroxylum Coca* in the Botanic Garden at Georgetown, but apparently now extinct.

Pulvinaria sp., rare on leaves of sugarcane.

P. pyriformis Ckll. (mealy shield-scale), common on guava, avocado and ornamental plants.

P. simulans Ckll., recorded on *Licuala grandis*.

Ceroplastes denudatus Ckll., recorded in 1893 on *Codiaeum*, but not found since.

C. dugesii Towns, recorded on *Schinus terebinthifolius*.

C. floridensis Comst. (Florida wax-scale), common on limes and various ferns.

Vinsonia stellifera Westw. (glassy star-scale), very common on leaves of coconut and other ornamental plants, on French cashew (*Eugenia Jambolana*), *Citrus*, and various forest trees of the interior.

Eucalymnates perforatus Newst. (tesselated shield-scale), occasional on leaves of coconut and French cashew.

Coccus hesperidum L. (common shield-scale), common on *Citrus* and Liberian coffee.

C. mangiferae Green (mango shield-scale), common on leaves of jasmine (*Eugenia paniculata*) and mango.

Saissetia begoniae Douglas, described in 1892 on begonias, but not found since.

misphaerica Targ. (brown shield-scale), common on Liberian coffee, *Citrus*, guava, various ferns, etc.

igra, Nietn. (hibiscus shield-scale), very common on *Sapium Jen-manni*, Para rubber, ochroe (*Hibiscus esculentus*), *Codiaeum* sp., egg-plant, cotton, sunflower and various ornamental plants.

ae Bern., common on *Citrus*, *Duranta* and various ornamentalplants.

Injurious Scales from the Seychelles. — GREEN, E. ERNEST, in *The Journal Economic Biology*, Vol. 9, No 1, pp. 47-48. London, 1914.

In a small collection of injurious insects from the Seychelles, the ving scales have been determined.

Aspidiotus ficus Ashm., on leaves of *Zamia* sp. (Cycadaceae), much n for ornament in tropical countries.

A. bromeliae Newst., on leaves of pineapple. The discovery of this es is interesting, as it was previously only known from examples found ineapples on sale in England, probably from the Canaries. The nt of infection appears to show that it may do a good deal of damage.

Lecanium hesperidum L. and *L. tessellatum* Sign., on leaves of water nth (*Eichhornia crassipes* = *E. speciosa*). As this plant is very ful in blocking canals and rivers (1), the scales must be considered l in this case.

.. hemisphaericum Targ., on leaves of *Justicia Gendarussa*. Many s of the genus *Justicia* are shrubs with very ornamental flowers; seem to be particularly subject to the attacks of scales, in Ceylon *Orthezia insignis*. *L. hemisphaericum* is a cosmopolitan species, ing almost all plants except Coniferae and Gramineae.

Experimental Demonstration of a Difference in Biological Race between e Phylloxera of the South of France and that of Lorraine: *Peritymbia Phylloxera) vitifolii pervastatrix.* — BÖRNER, CARL, in *Zeitschrift für gewandte Entomologie*, Vol. I, Part I, pp. 59-67. Berlin, 1914.

s the writer had previously observed differences between the beha- of the phylloxera of Villers l'Orme (Lorraine) and that of the South nce towards certain varieties and species of vines, he proposed to line by means of experiments with both kinds of phylloxera whether fferences observed were due to a difference of race or to the different e or nutrition of the insect. With this object in view, American nd their hybrids with European vines were infected with phylloxera Lorraine at Villers l'Orme, while in a French vineyard at Pagny-selle (near the frontier) gall-producing phylloxera brought ex- from the south of France were used. The vines came from the same r plants, were of the same age and had all been grown in Lorraine. ifference in the susceptibility to attacks in vines of the same variety thus be due only to some biological difference in the phylloxera o infect them.

ie experiments showed that biological differences really exist and

See No. 333, *B.* April 1913.

(*Ed.*)

reveal themselves in the repulsion shown by the phylloxera of Lorr to certain vines which are attacked by the French phylloxera. The wr therefore considers the Lorraine phylloxera as a distinct race (the *Perva trix* race).

Among the results of the experiments the following are to be mentio At Villers l'Orme the following varieties inoculated with Lorraine phy xera proved completely immune and showed no galls on the leaves nodules on the roots: Riparia Gloire de Montpellier, Riparia × Rupes 107 Geisenheim, Riparia × Rupestris 3306 and 3309 Couderc, Ripari Chasselas 24 Laquenesey, Cordifolia × Rupestris 19 Geisenheim. I ated small fertile galls together with sterile galls and punctures and oc sionally small nodosities were found on Aramon × Rupestris Ganzin No. A regular formation of larger or small nodosities, together with the abse of leaf galls, was shown by Riparia × Rupestris 175 Geisenheim, Ripa × Rupestris 101-14 Richter, and Riparia × Cunningham 535 Obe

These varieties all showed normal formation of galls and root no sities when inoculated with phylloxera from the South of France, w the exception of Aramon × Rupestris Gauzin No. 1, which behaved the same way to both races (1).

Whether the *Pervastatrix* race has arisen through adaptation to E pean vines or already existed in America on the Labrusca vines so cl allied to European vines, has not yet been decided. Apparently climat not had any noticeable influence on its development.

Notwithstanding the very numerous infection experiments u under varying conditions, it has never been possible to get the *Pervast* race to adapt itself to one of the completely immune vines; it may then be assumed that it is impossible for the *Pervastatrix* race to readapt i from its usual host plants (European and Labrusca vines) to plants mune from its punctures, because on the latter it dies.

In the cross between immune and susceptible vines, immunity parently behaves as a dominant character.

Inoculations of immune vines with root phylloxera coming from Als Württemberg and Saxony have never led to infection, so it may be cluded that the *Pervastatrix* race has a wide distribution in Germany.

The writer divides the vines so far examined as to their behavi towards the *Pervastatrix* race into the four following groups:

1. *Immune vines*, embracing many pure races of *Vitis riparia* (*pina*), as well as *V. rubra* and the races of *V. Berlandieri*; then a num of hybrids, for instance Riparia × Rupestris Couderc 3306 and 33 Geisenheim 107, Cabernet × Rupestris 33 a 1, Cordifolia × Rupes Geisenheim 19 and 20, Hybrid Franc, Hybrid Dromois.

(1) Recently vines which had proved immune to the *pervastatrix* phylloxe repeated inoculations (1912 and 1913), were inoculated with phylloxera from the of France and immediately showed the formation of root nodosities.

(*Authors' note*

2. *Vines subject to attack.*

a) Vines slightly attacked, generally quite free after the winter stant vines). To this group belong the following: Aramon × Rupestris zin No. 1, Mourvèdre × Rupestris 1202, Aramon × Riparia Teleky B, Riparia × Gamay Oberlin 595 and 604.

b) Vines which permanently show leaf galls (mostly sterile) and ; nodosities, but which for the most part are resistant: Riparia × estris 101-14, Riparia × Vinifera 44 Laquenesey, Madeleine royal × aria 33 Laquenesey.

c) Normally attacked vines (fertile galls and root nodosities), suscept- to permanent infection, and easily attacked: *Vitis vinifera* and *V. stris* (European vines); then *V. Labrusca* with its hybrids, and the rican vines; *V. arizonica*, *V. Berlandieri*, *V. cordifolia*, *V. monticola*, *almata*, *V. rupestris* and *V. Solonis*. This group also includes several tic vines and numerous hybrids: Berlandieri × Riparia, Rupestris × fera, Riparia × Labrusca, etc.

According to the writer it would be strongly advisable to impose greatest limitation on the introduction of foreign vines into Germany, ccount of the danger of introducing the phylloxera from the South urope.

- **Hymenoptera Parasitic on *Aphis euonymi*, the Beet Aphis** (1). — MAQUIN, A., and MOITRÉ, A., in *Comptes rendus hebdomadaires des Séances de la Société de Biologie*, Vol. LXXVI, No. 16, pp. 803-805. Paris, 1914.

So far seventeen secies of Hymenoptera have been found to parasitize *is euonymi*. They are as follows:

Aphidiidae: gen. *Praon* (one sp. near *P. abjectus* Halid.); gen. *Trioxys uctus* Hald., *T. heraclei* Hald.); gen. *Aphidius* (*A. crepidis* Hald., *A. ae* Hald. and two others).

Proctotrupidae: gen. *Lygocerus* (*L. antennalis* Kief., *L. rufipes* Thoms.); *Sceliolina* (two undetermined species).

Cynipidae: gen. *Allotria* (*A. minuta* Hart. and two other spp. undetermined); gen. *Alloxysta* (*A. crassa* Cam.).

Chalcididae: gen. *Encyrtus* (one sp. undetermined); gen. *Pteromalus* sp. undetermined).

The two commonest species are *Trioxys auctus* and *Aphidius crepidis*. attack chiefly apterous individuals of the aphis, laying one egg in ; the act of oviposition takes two or three seconds. The parasitized shows no unusual symptoms for three or four days, and if not adult nues to grow and complete its metamorphosis; after this it becomes ish, turns from black to pale olive-green and finally to brown, swells id dies. The dead body is almost spherical and adheres to the leaf by s of a sticky liquid, thus presenting a very characteristic appearance. *T. auctus* takes three weeks to develop, while the aphis requires fifteen ghteen days, according to the weather; other parasites (*Aphidius*, *rius*) take about as long as *Trioxys*.

See also No. 296, *B.* March 1914.

In autumn, the latest Hymenoptera deposit their eggs in the sec female aphids, then living on spindle (*Euonymus europaeus*). The fem pass the winter on the twigs, and the Hymenoptera emerge from the pa sitized ones towards the end of March or in early April; the heal *Aphis euonymi* appear early in March.

The pupa of *Trioxys* within the aphis is protected by a white si covering, whereas that of *Allotria* is covered only by the empty skin its host.

As showing the importance of these parasites, the writers refer the two following cases of infection:

a) On the 9th and 19th of June, 1913, twenty individuals of *Tri auctus* of both sexes were liberated in a breeding-cage containing beets whose leaves were infested by about a thousand aphids; on 2nd of July more than 500 showed the characteristic appearance of be parasitized.

b) In a small garden, plants of *Euonymus*, beets, *Lysimachia vulga Epilobium angustifolium*, thistles, etc., were covered with aphids; at beginning of July some thousand individuals of *Trioxys auctus* and *Ap dius crepidis* were liberated: by the 15th of August it was almost impossi to find a living and healthy aphis; some stems of beets for seed sho over 300 parasitized aphids.

801 – **New Species of *Aphelinus* Parasitic on Injurious Aphids in Russia** — KURDJUMOV, N. B., in *Revue Russe d'Entomologie*, 1913, Vol. XIII, N pp. 266-270. St. Petersburg, 1913.

Four new species of *Aphelinus* (*Chalcididae*) have been bred injurious aphids at the Poltava Experiment Station. They are as foll *A. toxopteraphidis* and *A. flavipes* from *Toxoptera graminum* Rond *hordei* from *Brachycolus noxius* Mordw.; and *A. atriplicis* from *chenopodii* Schrank. (*A. atriplicis* L.).

802 – **Two New Genera of Hymenoptera Parasitic on *Ectoedemia*.** — R S. A., in *Psyche*, Vol, XXI, No. 2, pp. 79-81, figs. 1-2. Boston, Mass., 1914.

The writer describes two new genera of Hymenoptera, *Anomop* and *Centistidea*, each represented by a single species; these genera be to the sub-family *Liophroninae*, and come near *Centistes*.

Anomopterus fasciipennis is parasitic on *Ectœdemia phlœophaga* Bu and *Centistidea ectoedemiae* on *E. castaneae* Busck, both of which are i rious to sweet chestnuts in Virginia.

803 – ***Remigia repanda* (Lepidoptera), Injurious to Crops in Sao Paulo, Br** — HEMPEL, ADOLPHO, and D'UTRIA, GUSTAVO, in *O Fazendeiro*, Year VII, N pp. 110-111. São Paulo, 1914.

Remigia repanda is widely spread in the State of São Paulo; its lar are very voracious and feed chiefly on Gramineae, in particular mai rice and sugarcane. The moth has a number of broods in the year.

(1) See also No. 294, *B.* March 1914.

To prevent attacks, one measure is to burn off the vegetation of waste
s, in which the eggs are laid.
If a crop is attacked, aceto-arsenite of copper may be used as a spray
. per 100 gallons of water, with the addition of 2 lbs. of soap and 4 lbs.
gar, or 1 gallon of molasses, to make it stick). For grass crops 1 lb.
00 galls. is enough. In some cases it may be worth while to burn off
p and plough it under, so as to destroy the larvae and pupae and pre-
subsequent attacks.
To stop the larvae spreading, trenches may be dug round the centres
fection. A belt of quicklime on the ground will also stop them.
Many birds are useful in destroying these larvae.

. The Lesser **Bud-Moth *(Recurvaria nanella)* on Apples in Michigan.**
– SCOTT, E. W., and PAINE, J. H., in *Journal of Agricultural Research*, Vol. II.
o. 2, pp. 161-162. Washington, D. C., 1914.
In the spring of 1912, during spraying experiments on apples at Ben-
Harbour, Scott noticed serious damage caused by small larvae to the
of unsprayed trees; in one neglected plantation in the neighbour-
, the insect was largely responsible for a complete loss of crop. The
age was attributed at the time to the eye-spotted bud moth (*Tmetocera
ana* Schiff.).
In 1913 the life-history was followed out; various differences were
d between the insect from Benton Harbour and *T. ocellana*. On exa-
ng the adults, A. C. Busck referred them to *Recurvaria crataegella*,
ibed by him in 1903; further research by Busck and the writers has
n that this is identical with the European *R. nanella* Hübn. (known as
sser bud-moth), so that *R. crataegella* is to be considered a synonym
.

uropean authorities had recorded this species on apple, pear, apri-
ach, cherry and plum. According to Staudinger and Rebel (1901),
stribution in Europe is: C. Europe, Sweden, N. Spain, S. France,
N. Italy, Dalmatia and S. W. Russia.

Coccus *citricola*, a New Scale infesting Citrus Trees in California. –
MPBELL, ROY E. in *Entomological News*, No. 5, pp. 222-224. Philadelphia, 1914.
n 1909 a scale was found on citrus trees at Claremont which appeared
fer from the common *Coccus hesperidum* L.; it was first referred to
gulus Dong. and then to *C. elongatus* Sign., but the writer has re-
determined it to be a new species, which he names *C. citricola*.
t is so far known only from leaves and branches of *Citrus*. The young
mostly settle down on the leaves, but when half grown they migrate
twigs. None have been found on branches more than half an inch
meter, and they are confined to the lower branches. When the scales
undant, as often happens, they fit over one another in a characteristic
like tiles.

The insect has recently become much more abundant, and has be found in many fresh localities in Southern California, in the Lower S Joaquin valley and to a slight extent in the Sacramento valley. It h probably existed for some time in California, and may very likely ha been confused with *C. hesperidum*.

The writer gives the systematic and biological characters distinguishi *C. citricola* from *C. hesperidum* and *C. elongatus*.

ALFREDO RUGGERI, gerente responsabile.